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## COASTAL PLAINS CENTER



for MARINE  
DEVELOPMENT  
SERVICES

# 2/ REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES

DECEMBER 11-12, 1975

SAVANNAH, GEORGIA

Sponsored by:  
Coastal Plains Center  
for Marine Development Services  
in Cooperation with:  
Virginia  
North Carolina  
South Carolina  
Georgia  
Florida

COASTAL PLAINS CENTER  
SAVANNAH, GEORGIA

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Coastal Plains Center for Marine Development Services

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## FOREWORD

The Coastal Plains Marine Center is supported by the Coastal Plains Regional Commission to provide continuing technical assistance to the public agencies, academic institutions, and private enterprises engaged in managing, exploring, and developing marine resources in Virginia, North Carolina, South Carolina, Georgia, and part of Florida. The Center accomplishes its overall purpose by transferring information and by coordinating the sharing of expertise across State lines. It acts as a focal point for scientific and technical information on the marine environment of the Region, its resources, and its economic potential. The Center provides advisory and consulting services and processes requests for information, free of charge, on all matters dealing with marine environmental development of the Region. It establishes and maintains communications between individuals and organizations in the Region, both public and private, that are engaged in marine science and engineering research, development, education, industry, and management. Through such means as the sponsorship and conduct of this Conference and the publication and distribution of this Report, it stimulates interest in the use of available technology for the development of marine resources.

The purpose of this Conference was to serve as a means through which Federal, State, and local government administrators, scientific researchers, and representatives from private industry, as well as private citizens, could address some of the major coastal and marine issues facing the Coastal Plains States. The Conference brought together leaders in marine fields from both inside and outside the Coastal Plains Region and having many different backgrounds and approaches to the problems addressed. These participants exchanged recent findings and ideas, and through the wider dissemination of this Report, much of this information is being made available to a much greater audience.

This Conference was coordinated and this Report compiled by Philip G. Hill of the Center staff. The entire Center staff participated in the editing of the presentations for publication. The Center expresses its thanks here for their participation to the co-sponsoring States of Virginia, North Carolina, South Carolina, Georgia, and Florida; and to all of the session chairmen and speakers whose names are listed in the Table of Contents of this Report.

BEVERLY C. SNOW, JR.  
Executive Director  
Coastal Plains Center for  
Marine Development Services

January 31, 1976

# COASTAL POLICY MAKING AT THE STATE LEVEL

By **NORMAN L. UNDERWOOD**

*Executive Secretary  
Office of the Governor of Georgia  
Atlanta, Georgia*

I appreciate being asked to participate in this program more or less as a stand-in for Governor Busbee. He had planned to be here tonight, but about two weeks ago he had to cancel to attend a legislative meeting up in North Georgia.

Not so long ago, I took a walk one afternoon with my 6-year old son on the beach down at St. Simons Island, and that was just before he started to school and he had not yet learned to read. One of the words that he could recognize on sight was the word "Busbee". We had been walking on the beach a while and he came running down to where I was and he was very excited, and he said, "I found a big sign with 'Busbee' on it". So I followed him up a little trail close to where the Coast Guard station is, and sure enough, there was a big sign that somebody had put up, and the sign said, "If you want this beach to remain public, write to Governor Busbee". Under the illusion of enhanced powers of thought you get when you are out on the beach, I started thinking about that sign. I had two very distinct and somewhat conflicting sentiments about it. On the one hand I have always preached that when you have a position on an issue in the public realm, you ought to say what that position is and urge other people to do the same thing. But I was a little bit disturbed about the implied simplicity of that sign. At that moment the issue of private beaches vs. public beaches was before our State Supreme Court in a case that was incredibly complicated. The Governor had written to the Attorney General and urged the Attorney General to use all the powers of his department to assert the State's position that beaches are subject to the public trust. I had read some of the briefs in this case, and I knew that there is at least a possibility that that case might rest on a statute that was adopted in 1904. In other words, the executive branch had a position which might or might not stand up in the judicial branch because of something that the legislative branch had done over 70 years ago. I was fascinated by the realization that the prospects of my son being able to walk on that same beach with his son, and the status of that beach and, in a real sense, the status of the quality of life in the coastal zone during his time, were going to be determined by the interplay between judges I

knew, and lawyers I knew, and politicians I knew, and men and women I worked with just about every day, and the subtle and not so subtle forces that influence their actions or inactions. That sort of interplay, that disturbing and sometimes exhilarating process that takes place between people in politics, and lawyers and judges, and lobbyists and interest groups, produces something which comes ultimately in a kind of nicely packaged form that we call state policy.

I suspect that most of you are a little bit like that property owner that put up that sign down on St. Simons. You have some fairly strong notions about the direction of policy in the coastal area, and you probably have some frustrations about piercing the political veil and getting official policy to reflect at least some of what seems so clear to you. I do not have any tried and true techniques for transplanting rational recommendations into governmental policy at the state level even if we could agree on what is rational. What I would like to do is to make two or three observations about the process of coastal policy making at the state level. This will not be new to you, but I hope it might be useful in keeping in focus at least one of the concerns that you have to be aware of and deal with and live with.

You do not have to be a scientist or economist or anything but a person with common sense to see that coastal policy making in the next few years is going to be a very high stakes kind of a game. It seems to me that the thing which gives the most pause and is the most disquieting about the long-term future of the coastal zone is the fragile relationships that you have in this area. I have the hardest time coping with barn-door policy making. Now what is barn-door policy making? All of you have heard the old statement, "It does not do much good to close the barn door after the horse is gone". Actually it works pretty well if you have several horses. A fact of life is that an awful lot of policy in this country is made in that fashion, after at least one of the horses is gone. We get something like Watergate and then we have a wave of ethics legislation. We have a mining disaster and then we get mine safety legislation. Our rivers get so polluted that voters can not fish in them and then

we get water quality control laws. Whether we like it or not, that tends to be the pattern of policy making in this country. I have the impression that the reason coastal policy making is a slightly different ball game is that this barn door kind of policy making has a lot of obvious limitations, whether you are talking about the coastal zone in terms of the natural environment or in terms of economic development. Second chances are harder to come by, and mistakes are harder to correct. Because of this it seems basic and obvious to me that a special sort of responsibility devolves upon those who potentially have a role in coastal policy making, whether political or legal or scientific.

There are very few subjects that I can think of that have the commingling of sophisticated political, legal, scientific, and economic issues that we have coming together in coastal zone policy making. There is always the danger of oversimplifying, but I think that in terms of state government there are three key questions that determine whether an idea or a suggestion or a proposal have much of a chance of becoming policy. One, is it in phase with the public mood? Two, does it square with the current economic realities? And three, will it stand up in court?

What is the public mood? People in politics can not define it, but they know it when they see it and when they feel it. I believe that the idea that beaches and marshes are subject to the public trust is probably in phase with the public mood now, but five or ten years ago I doubt that it was. The public mood can be fickle and frustrating, but it can also be influenced by information and understanding, and that is obviously a crucial element in policy making.

What about economic reality? You may have the proposal of the year for the Georgia coast this year, but if it is going to cost a lot of money to the State next year, you can forget it. We do not have any money for new programs. We barely have enough money to continue our existing programs. Your proposal for the Georgia coast may be rational and it may be right, but if it is going to cost a lot of money to the State next year, it is not going to be the State policy because the State can not afford it. It is just about that simple. In connection with this, I want to mention how important I think it is to be straight and candid with the State in making cost projections on projects, no matter how big the numbers. We have a beach nourishment project out on Savannah Beach which is not quite completed. We are looking all around trying to find \$160,000 we need to complete the project, and it is not easy to

come up with that kind of money. For reasons that I do not think are anybody's fault particularly, that project has escalated in cost several times since it started, and quite frankly we would be very gunshy about another beach nourishment project beginning right now because of our concern about the reliability of cost projections. So I think it is better to face the music, and go ahead and be candid and be liberal with cost projections, and figure all the contingencies and get it out on the table, rather than have that happen in future projects.

The final question is whether it will stand up in court. It does not do much good to develop an impressive policy proposal if it will not pass muster legally. There will be a lot of litigation coming out of the coastal zone in the next few years as the courts struggle with the conflict between the traditional notions of property rights and emerging public rights. In the current beach litigation in Georgia, the property owners contend that they own the beach and restrict access because of a 1904 statute that purported to give them title down to the low-water mark. The State contends that the legislature that adopted that law acted on assumptions which belong to antiquity. Obviously the way that case comes out will have broad policy implications, and it is quite clear that the courts will have a large role in shaping the future of the coastal zone.

Now where does our current policy stand and what can you do about it? With respect to the beaches, as I said, it is the policy of the State that the beaches and marshes are subject to the public trust. If the courts should conclude something different, it would be helpful to have your suggestions about whether or not legislative action on a Constitutional amendment on this subject would be in order and would be feasible. If we were to have a Constitutional amendment, it would have to be voted on Statewide, and that obviously would involve a campaign. With respect to Outer Continental Shelf drilling, it is the policy of the State to encourage oil and gas exploration subject to a number of limitations and conditions. For example, we made certain negative nominations. We have asked the Interior Department to have some baseline studies conducted prior to leasing. We are a little bit concerned about Interior's level of sensitivity to onshore problems which fall within the State's responsibility. We hope that will not ripen into any kind of major problem. It is a policy of Governor Busbee actively to promote the coastal zone for economic development. I do not believe the Governor has talked with any industrial prospect



about this region without having Leonard Ledbetter, who is the head of our Environmental Protection Division, in on those discussions.

The basket in which most of our eggs are resting in terms of policy for the coastal zone, is the Coastal Zone Management Program. You are familiar with that program. It is based on the premise that policy can be forged out of the interplay between State and local viewpoints. Nobody is under the illusion that that process will be simple or painless, but I hope none of us is proceeding under the assumption that the program is naive in the level of cooperation that it contemplates. In a real sense it seems to me that the Federal Government and the State, as well as the local governments, have bet a lot of their chips on the proposition that the Coastal Zone Management Program is a workable concept. If we are wrong about that, we are all big losers.

In developing coastal policy, we are holding our own, but we are obviously at the point where major progress is going to have to be made. A couple of weeks ago, Justice William Douglas retired from the U. S. Supreme Court. Justice Douglas was one of those forceful intellects who always seemed to have

everybody hating them or loving them. Now regardless of what you think about his political philosophy and the opinions he wrote, he recognized earlier and more clearly than any other public man in America the relationship between politics and law and natural resources. It will be a long time before our State and most of the states represented here and the Federal Government live up to Mr. Justice Douglas's expectations, but it is clear we are moving in his direction. He has written the first volume in an autobiography. This first volume is called Go East Young Man, and it is a very good book. In the front cover, he has written this: "The aim of this book is the hope that our people will come to love the Nation, to see in perspective the great and glorious tradition of liberty and freedom entwined in our Constitution and Bill of Rights. I hope they will come to love the Continent, the most beautiful one in the whole world. I hope that before it is too late, they will develop a reverence for our rich soil, high mountains, and mysterious estuaries. I hope they will put their arms around this part of the wondrous planet, love it, care for it, and treat it as they would a precious and delicate child." And to that I would say "Amen."

# **THE COASTAL PLAINS REGIONAL COMMISSION— U.S. GEOLOGICAL SURVEY AEROMAGNETIC-AERORADIOACTIVITY SURVEY**

**By ISIDORE ZIETZ**  
U.S. Geological Survey  
Reston, Virginia

The funding of the aeromagnetic-aeroradioactivity surveys of the Coastal Plains Region is completely done by the Coastal Plains Regional Commission. What I will describe to you is the first effort in a series of these surveys, representing a total cost of \$100,000, which was divided equally among the States of North Carolina, South Carolina, and Georgia. The data is quite good pertaining to all three States. I am really at a disadvantage describing geophysical data to this group because I realize that most of you are not geophysicists. So, if you will permit me, I will talk somewhat about basics; otherwise we will not be able to communicate. If those of you who do have a little background in geophysics will bear with me and go through the monotony of what I am about to say, I think everything will be copacetic.

What I would like to do is explain the joint aeromag and aerorad coop, so I will break my discussion into two parts. First, we will talk about the aeromagnetic work, and then, later on, about the aeroradioactivity work. I am sure most of you are not familiar with the physical set-up required to do a survey of this type, so let me explain a little about it to you. In conducting the aeromagnetic portion of the survey, we put a very sensitive instrument, called a magnetometer, into an aircraft and flew continuous lines at an altitude of 500 feet. The magnetometer measures to 1/100 of a gamma. When you consider that the earth's field, which is not very big, is 50,000 gammas, then the 1/100 of a gamma accuracy is pretty good. The lines, or profiles, can be flown east-west or north-south, but are usually flown at right angles to the structural framework of the geology of the area being surveyed. In this case, we flew these surveys primarily east-west. What is significant is that these are continuous profiles. It is not as if you were on the ground recording the magnetics at discrete points, but you are examining, over the length of one flight line, an infinite number of points so that you obtain a beautiful analogue record along the entire length of the line. Specifically for this program, the distance between the east-west flight lines was one mile. So, we have an aeromagnetic survey flown on continuous profiles

at 500 feet above the ground, with a flight separation of one mile.

After the data have been collected, we then compile contours from the information obtained. This is the form that we really want to see. All the data have been digitized and put on magnetic tapes so that anybody who wants to use it can do so and you can be assured that industry representatives will be very interested in looking at it. But for geologic interpretation, we are satisfied with the contoured material. We do one other thing to the information which is pretty important. We remove the earth's main magnetic field, which is about 50,000 gammas, from our observations, so that what you see on a map is a series of anomalies. What do these anomalies represent? This is always the problem, the interpretation of the data.

We flew this survey because we were looking for mineral deposits. When we say mineral deposits, we are talking about two things. We are talking first about hydrocarbons or oil and secondly, ore deposits. Now in geophysics, particularly in magnetics, or in any geophysics really, you never really find mineral deposits as such. You do not do a survey and say well here is oil, but what you attempt to do is to correlate your data with the geology and then, hopefully, the geology will contribute to your understanding of the accumulation of hydrocarbons, or to the ore deposits. For example, we know that you find oil in certain sedimentary horizons, and that the sediments have to be coarse and permeable. But that is not really enough. You have to have a geologic trap, something that makes the oil stay where it is. This trap is usually some kind of geologic structure in the form of a mound, a hill, or a fault, where the fault acts as a barrier so that as the oil accumulates, it has nowhere to go. Now, in conducting an aeromag survey we do not find the hydrocarbon, and we do not find the sediments, because sedimentary rocks are nonmagnetic. Presumably the magnetic crystalline rocks of the Piedmont underly the Coastal Plain sediments, so, in conducting the aeromagnetic survey, we are looking for a structure, several structures, or perhaps faults. The same is

true when you use magnetics relative to ore deposits. The only way ore deposits are found using magnetics is if the deposit, itself, happens to be magnetite. All the other ores are not magnetic, but we know that many ore deposits are almost always associated with igneous intrusions. These intrusive rocks are not exposed at the surface, but are covered with from a few feet up to hundreds of feet of sediment. Although you cannot see the intrusives at the surface, they show up if you run a magnetic survey. Billions of dollars of ore deposits have already been found in this way. As a side remark, the Soviet Union has flown a magnetic survey of the entire U.S.S.R. at one mile spacing and the whole Canadian Shield has now been flown using magnetics at a half-mile spacing. This was done strictly to find ore deposits, and has been successful. So, we are doing exactly the same thing, except in a very limited way in a specific area, with the hope that maybe we will find something. We may not find ore deposits, but we already know that magnetics and radioactivity, which I will explain later, have been extremely useful in evaluating the geology of the basement rocks that lie beneath the Coastal Plain.

Again, the sedimentary rocks in the Coastal Plain are nonmagnetic. The rocks that are magnetic are the crystalline rocks that are exposed at the surface in the Piedmont. Beneath the Coastal Plain, if you start at the fall line, the thickness of the Coastal Plain sediments will be zero. These will gradually thicken until you get to the coastline, and there the sediments will be in the vicinity of a thousand or two thousand feet thick. What the magnetics show in the Coastal Plain is the underlying hard rock, or what we call the basement.

The data from these surveys is published at a scale of an inch to a mile, which is 1:62,500. But to see the Regional picture, we have to reduce this information to a scale of 1:500,000. This is a tremendous reduction, so we pull contours, removing the earth's main magnetic field, and then color code the data. Each color represents 100 gammas and proceeding through the optical spectrum, the smallest intensities are represented by the violets and blues with white representing the hottest areas of all.

As you know, the fall line is approximately that line which separates the Piedmont on the northwest and the Coastal Plain on the southeast. Geologists have previously thought, and at that time correctly so, that the Piedmont rocks, and those underlying the Coastal Plain were very similar. However, the

information collected during our surveys, and shown on our maps, shows that there is a vast difference between the magnetic character on either side of the fall line. To the northwest of the fall line we see anomalies, but they are not very large. Since the anomalies generally run in the northeast direction with the grain of the crystalline rocks, they are consistent with what we would expect. On the other side of the fall line, however, that grain completely disappears. It is as if we are in another world and we think that the earth's crust on this side of the fall line might be very different from that on the other side. Another thing that is very interesting is the tremendous amplitudes of the anomalies which occur in this area. We also have a gravity map of this area which supports our thinking. It shows us that the gravity is very different on both sides of the fall line. We suspect that because we have a large gravity anomaly to go along with the large magnetics, the rocks underlying this area are very dense mafic rocks. These are the kinds of rocks that you might find in the oceans.

The Nuclear Regulatory Commission, formally known as the Atomic Energy Commission, is terribly interested in the geology of the Charleston, South Carolina area because of the famous Charleston earthquake in the 1880's. Since then, there have been minor earthquakes, but the real question is what triggered the Charleston earthquake? This is the number one priority to the Nuclear Regulatory Commission in the eastern United States. They are investing millions of dollars to find out the cause. The magnetics data have given them more information than anything they have yet done. In the Charleston area are enormous magnetic intensities. Associated with these anomalies are lineaments that are emanating from them which we think are dikes and sills. We really think that this is a rift that opened up in the earth's crust allowing these dikes and sills to intrude, indicating that there must have been a lot of faulting in the area in the past. We think there are faults there now. So we are talking about a lot of tectonic activity which means maybe we have faults, and if we have faults, then you had better worry because you do not want to put a nuclear reactor on a fault. This is the one thing that the Nuclear Regulatory Commission does not want to do.

The thinking now is that there is a strong possibility that this entire area may be composed of basalt, gabbros, or rocks of that nature. Now basalt is the kind of rock found in the oceanic crust. I am not saying this is the oceanic crust, but this is a

terribly interesting area from a geologic hazard standpoint.

To carry this discussion a little further, from 1964 to 1966 the U.S. Naval Oceanographic Office (Navoceano) flew an aeromagnetic survey and compiled a map showing the magnetics from Maine to Florida, including the adjacent offshore areas. The flight line separation of Navoceano's survey was five miles, compared to the one mile spacing we used in our survey. I mention this map because in the area that we have been discussing, it appears that these big magnetic anomalies do not stop onshore, but continue until they reach the edge of the continental margin. This suggests that there is a major fracture in the earth's crust along the lines of these anomalies. I think that if we did the detailed work offshore and continued over the Cape Fear Arch that we would find the same kind of anomalies.

The results of our survey are very different from what had been expected and have created a terrific amount of excitement among geologists in the southeast. The Nuclear Regulatory Commission has now told us that they will invest \$400,000 or \$500,000 to drill three exploratory holes in the area. Almost all of their work is being based on the fact that they now have this magnetic data.

Now I will talk a little bit about the radioactivity surveys. We conducted the radioactivity survey for a couple of reasons. First, it only costs about one dollar extra per line mile to do the radioactivity survey along with the magnetics. From that standpoint alone, we knew that if we were to get anything at all from the radioactivity, it was surely worth it from an economic standpoint. We also knew from previous mapping work in the Piedmont that the radioactivity maps were just as valuable, if not more so than the aeromagnetics. In conducting a radioactivity survey you again put a sophisticated piece of equipment into an airplane, but this time you are measuring the total gamma ray count emitted from the rocks. You have to get as close as possible to the surface of the ground so that the signal is not completely absorbed. The maximum flight elevation is 500 feet, the altitude at which our survey was flown. Also, soil absorbs all radioactivity, so the only information obtained is that for the first few inches of the surface, so you are really mapping the sediments. We hoped that we could come up with a contoured map that could be interpreted, but we had never done that before and did not know if we could indeed map the sedimentary rocks. More importantly, we felt that we could use the radioactive data for mapping specific ore deposits. We knew that there was a

titanium mine near the border between Florida and Georgia on the coast. We had flown the radioactivity of that area many years ago, and knew that there were radioactivity anomalies, due to monazite, or perhaps radioactive zircons. The titanium is an accessory mineral, but by flying the radioactivity surveys you can locate the monazite, which in turn is associated with the titanium, which is the ore deposit. By knowing the situation in coastal Georgia, we felt that if we flew not too many miles away we would have a chance of detecting other ore deposits, namely placer deposits. This is the real reason why we did the radioactivity survey.

During the past ten years, scientists from private companies, the USGS, and the various states have been collecting samples and measuring the mineral content along streams but this is a very difficult and time consuming process. I am surprised that no one thought of flying a complete radioactivity survey earlier and then contouring the information to locate the anomalies. This is what we did.

Again, the data was collected flying at an altitude of 500 feet with one mile spacing between lines. The cost of flying such a survey prevented us from flying a closer line spacing, but, fortunately, we were able to obtain enough information to develop contours and compile a map. The map shows that there are three major monazite belts, paralleling the Piedmont and extending from Alabama all the way to Virginia. Streams such as the Santee, Savannah, and the Altamaha Rivers drain in the southeasterly direction and carry these monazite minerals with them. The rivers, in turn, deposit these minerals downstream, sometimes in concentrations large enough to warrant further investigation as to their economic potential. Several terraces made up of materials having high radioactivity levels have been formed along the rivers in this manner. As most of you know, water itself will give a zero radioactivity reading; however, on our maps, some portions of the rivers show up as big radioactive highs because of the high mineral content. These are the things that warrant further investigation and sampling.

Whether the investigations are conducted by private industry or the Coastal Plains States is immaterial. We have the necessary basic information needed in looking for the placer deposits. The largest anomalies we found are along the Altamaha River. This certainly warrants investigation and the USGS and the State of Georgia did send a crew down to examine this area. They collected grab samples and then ran chemical measurements of them. There were two drillholes that had been put

down previously in the area and information from these were used to determine the thickness of the deposit. The initial results of this investigation suggest that this one deposit may be worth as much as \$1.5 billion. If you incorporate all six of the

deposits that are in that vicinity, it is estimated that the total value of the deposits could be as much as \$6 billion. If studies prove these estimates to be true, I would say that the investment of \$100,000 to do the surveys was certainly worth it.

# **THE VIRGINIA INSTITUTE OF MARINE SCIENCE, VIRGINIA'S OFFICIAL MARINE SCIENCE, ENGINEERING, EDUCATION, AND ADVISORY SERVICES PROGRAM**

**By WILLIAM J. HARGIS, JR.**

*Director*

*Virginia Institute of Marine Science  
Gloucester Point, Virginia*

Virginia is one of the great maritime states of the country. The Chesapeake Bay and its tributaries, and the adjacent waters of the Atlantic Ocean, are resources of great economic value and even greater potential.

The approximately 20,000 square miles of tidal waters and bottoms involved are regularly used by Virginians for many purposes. Millions of pounds of fishery resources, unknown tons of mineral resources, and billions of gallons of usable water are bounded by some 5,000 statute miles of valuable shoreline and hundreds of thousands of acres of wetlands.

Over half of Virginia's people and industries are located in the 33 Tidewater counties and three principal metropolitan areas of the Commonwealth whose fortunes are associated with the sea and its resources. Maritime and related commerce are mainstays of the State. Recreation, a major Virginia marine industry, thrives in Tidewater, by and on the sea. Multiple use and increasing demand have placed a premium on scientific knowledge, technological advance, timely advice and sound public and private management policies and institutions.

Problems related to effective management of the resources, environments, and amenities of our coastal zone were of concern to the State even before the Federal Government became so heavily involved. In the near future looms the promise and the attendant problems of the development of the Outer Continental Shelf's (OCS) petroleum resources and of other sources of energy, raw materials, and food associated with the continental shelf and slope areas of the Virginian Sea.

To maximize use of the marine resources and environments for the public welfare, to maintain their quality, and to retain sufficient quantity for the future are constitutional and moral goals of Virginia's government. To meet these goals, the General Assembly has created, and supported, several executive agencies with management responsibilities in various marine matters.

To provide the knowledge and skills these

managers need in order to solve the complex problems involved, the Virginia Institute of Marine Science (VIMS) was created over thirty years ago. Its legislative charter and mandate established by the General Assembly in 1940 have been modified and up-dated several times since. (Code sections involved are: §3.1-217.2; §10-190; §23.14; §§28.1-195 through 28.1-201; §62.13; §62.1-13.4; §62.1-13.5.)

VIMS, now enjoying National and International reputation as a major coastal zone institution for research, engineering, education and advisory services, is the principal oceanographic agency and institution of the Commonwealth, with responsibilities and functions specified in Title 28, Chapter 9 of the Code, often called Virginia's Oceanographic Law and elsewhere in the Code of Virginia (see above). Gubernatorial actions have affirmed the earlier actions of the Assembly in declaring VIMS the Coastal Zone Laboratory and the principal marine science program of Virginia. The Institute thus enjoys support from the legislative and executive branches as well as strong support from industry and the public.

The operations of the Institute are supported by General Funds from the treasury of the Commonwealth appropriated by the General Assembly. Additionally, VIMS is empowered to solicit and utilize funds from sources other than the General Fund. Until recently, the majority of financial support for the Institute was from Virginia. Unfortunately (in some respects), well over half of its support now comes from other sources, mostly Federal grants and contracts, with some contribution from industry.

Principal tasks are: (1) to do research (basic and applied) and engineering development on the marine resources and environments and their uses; (2) to provide advisory and technical services to public and private managers and users; and (3) to provide education in all areas of marine science and conservation.

Our purposes, therefore, are to learn all we can about the marine resources and environments, to help solve problems of importance to Virginia and

to impart knowledge and technical capability to public and private users and managers. Knowledge, relevance and performance are key words.

The major programs into which the more than 200 active research projects are now grouped are:

A. Preservation, Utilization and Enhancement of Coastal and Oceanic Environments

1. Preserve and improve the quality of marine and human life and ecology in the marine and coastal environment and provide for multiple uses of the environments which will include open spaces for recreation and for public use.
2. Develop the ability to predict and modify accidents of natural or human origin affecting the marine environment.
3. Develop techniques for restoration, compensation, enhancement and preservation of the marine environments.

B. Preservation, Utilization and Enhancement of Coastal and Oceanic Resources (Biological-Fisheries, Minerals and Waters, Etc.)

1. Utilize tidal waters, shorelines and wetlands to promote economic strength.
2. Assist in the development of plans and programs to utilize marine resources for optimum multiple use.
3. Assist in development of plans and programs to preserve and enhance marine resources.

C. Biology of Coastal and Oceanic Waters, Bottoms, Shorelines, and Wetlands

1. Develop an understanding of processes relevant to, as well as requirements and capabilities of, non-economic yet environmentally important biological organisms.
2. Develop basic data relevant to solutions of problems with the biological processes and populations.

D. Coastal Zone Hydrography (Chemical and Physical) and Geology

1. Develop an understanding of processes relevant to, as well as requirements and capabilities of, physical, chemical, and geological aspects of marine environments and resources.
2. Develop basic data relevant to solutions of problems with the physical, chemical and geological phenomena of coastal and oceanic waters.

E. Development of Techniques and Systems for Utilization, Preservation, and Enhancement of Marine Environments and Resources

1. For government
2. For industry
3. For public (where in public interest)

F. Research and Development in Marine Affairs and Activities — Research and Development related thereto (i.e. economics, legal aspects, socio-political aspects of marine environments, resources, uses, users, and public managers.)

G. Advisory and Consulting Services Related to Utilization, Preservation, and Enhancement of Marine Environments and Resources and Maritime Economic Activities

1. Consultation to State and Federal agencies and industry (when in public interest) on matters pertaining to marine environment and resources.
2. Advisory extension services
3. Public information services

H. Educational Programs in Marine Sciences and Technology and in Marine Affairs

1. Conservation education in marine science and ecology to primary and secondary schools.
2. Services to community and senior colleges and universities.
3. Educational programs with academic affiliates.

I. Administration and Support of Research, Engineering and Educational Programs of the Institute

VIMS serves Virginia from two locations, the main campus on the York River at Gloucester Point across from Yorktown and the branch site at Wachapreague on the seaside of the Eastern Shore (see Fig. 1). Vessels and instrument platforms are located at several strategic spots. The hydraulic model of the James River is another research and engineering facility of the Commonwealth, managed jointly by VIMS and the U. S. Army Corps of Engineers.

The area covered in our work includes all the tidal waters of the Commonwealth and the adjacent Atlantic Ocean, an extensive area (see Fig. 2). The VIMS staff consists of about 380-400 or more persons, including some 100 professional scientists and engineers, 101 technical employees, 95 administrative and supporting personnel and 80

graduate students. In the summer the staff is augmented by 4-6 additional scientists and 90 or more technical support people to handle the expanded field season.

As provided by law and by agreement between the governing bodies, the Institute serves as the School of Marine Science of the College of William and Mary and the Department of Marine Science of the University of Virginia. A working arrangement is developing between VIMS and the Community College System and between the Institute and The Mariners Museum. Thus, our facilities and scientific personnel do double duty for these institutions. VIMS has the benefit of the academic affiliation, certainly a mutually beneficial arrangement, and one which is an economical use of the public's money, to the public benefit.

VIMS is actively attempting to develop working relationships with other State institutions such as Old Dominion University, Virginia Polytechnic Institute and State University, and others with interests and capabilities relevant to problems of the marine resources and environments of the Commonwealth. To further our work in the region, we have also participated in the development of joint arrangements with other institutions. As an example, we are (along with the Johns Hopkins University, the University of Maryland, and the Smithsonian Institution) an active partner in the Chesapeake Research Consortium, Inc.

VIMS' products are knowledge, advice, and other technical assistance to decision-makers, including the General Assembly, executive agencies, industry and the public. Evidence indicates enhanced output and improving interaction and services.

Cooperative arrangements exist with the Marine Resources Commission, the Water Control Board, the Highway Department, the Division of Parks, the Virginia Department of Health, local wetlands boards, and many others. We are growing in effectiveness!

The Institute also works to inform the public and, with its affiliates, to produce competence within a unique, economic and productive organizational framework.

Aside from these aspects of continuing concern, major problems and programs of special interest and concern at this time are:

1. Coastal Zone Management
2. Outer Continental Shelf Oil and Gas Development
3. Fishery Management Improvements
4. Resource Inventory Preparation
5. Environmental Baseline and Inventory Preparations
6. Wetlands Preservation and Management
7. Environmental Impact Statements
8. Ocean Dumping and Pollution
9. Advisory Services and Technical Assistance Programs.

In each, VIMS has a major responsibility to try to help Virginia solve her marine problems. With the pressures of population and industrial growth and increased activity and interest in the Coastal Zone and the Outer Continental Shelf, we must increase our efforts.

VIMS will welcome your comments on problems of major interest to you, as well as suggestions as to how we can improve our services. We also need and welcome your support of our programs.



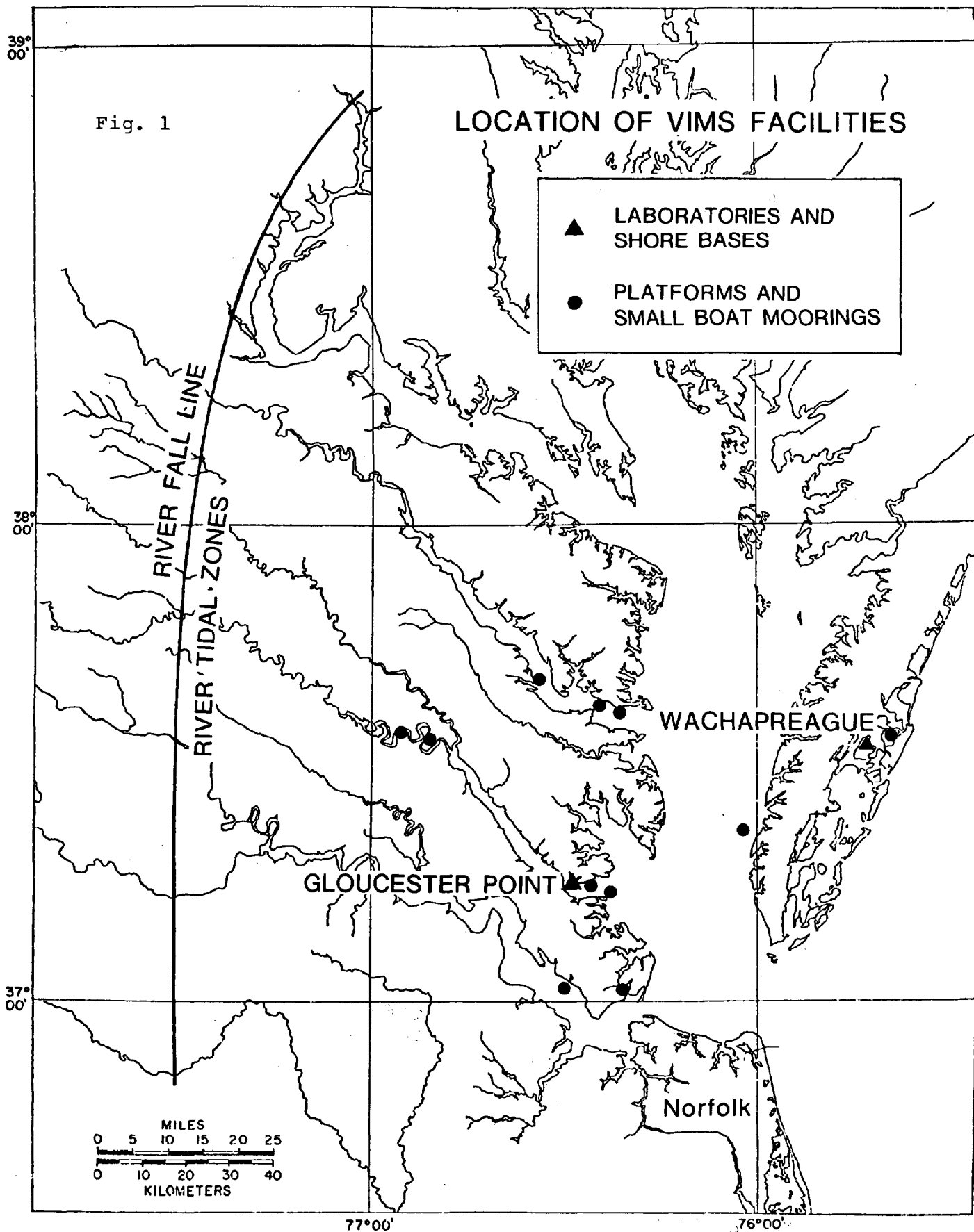
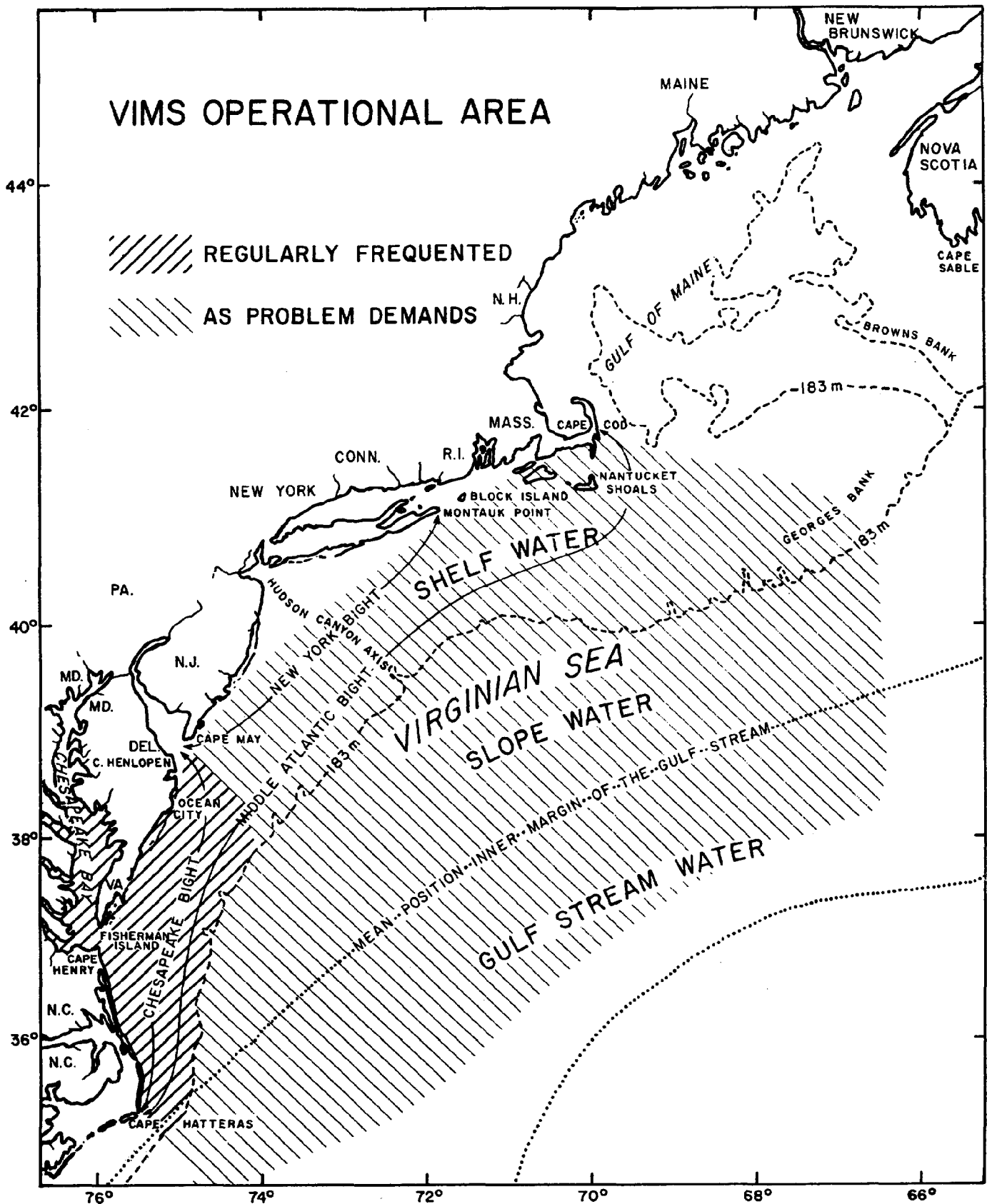


Fig. 2



# LINKAGES BETWEEN USERS AND UNIVERSITY RESEARCH IN THE FLORIDA COASTAL ZONE

By HUGH L. POPENOE

*Director*

*State University System of Florida Sea Grant Program  
Gainesville, Florida*

Although the Sea Grant Program of the State University System of Florida conducts major efforts in marine and coastal research and education, this presentation deals with the third element of Sea Grant, namely advisory services. Of Florida Sea Grant's budget, about 25% is devoted to its Marine Advisory Program.

Because we consider the Marine Advisory Program (MAP) the key link between the users and user groups of the salt water environment and the research and development faculty of the state universities, we are seeking to expand the MAP's role in identifying research priorities. This is in addition to its present functions of applying existing information to practical problems, as well as providing other services.

This paper reviews the organization, "grass roots" support, interagency and university relations, and reporting system of the MAP. This paper also serves as a progress report since the last presentation two years ago. This has been the first year of Florida's formal participation in Coastal Plains actions. Its University System Sea Grant Program is in its fourth year.

## ORGANIZATION

There is no standard framework for organizing Sea Grant advisory services across the country. The geography of Florida, with 38 coastal counties fronting 1400 miles of shoreline, is a significant factor. It and other considerations contributed to the initial decision to provide marine advisory services through the Florida Cooperative Extension Service. This provided an existing and well-organized delivery system.

Presently, the MAP staff on-campus consists of a coordinator, four state specialists in coastal engineering, marine economics, seafood technology, and communications. On the waterfront four multi-county marine agents are responsible for 16 counties. When matching commitments are included, a total of 92 people who devote from 5% to 100% of their time to MAP are involved.

## GRASS-ROOT ACTIVITY

A proven means of establishing a program responsive to local needs is the local citizens advisory committee. There are now such committees in 26 of 38 counties, organized with representation from commercial, private and public marine interests.

Not only do the committees stimulate local interest and involvement in Sea Grant, but also they are beginning to identify and request assistance with local problems. For example, on the Gulf coast the feasibility of monitoring a county fishing reef development is being evaluated. In the panhandle, a twin fishing trawl demonstration was requested, and on the lower east coast assistance with fishing gear development was requested.

Continued development of this "feedback" mechanism is being encouraged.

## UNIVERSITY SYSTEM INVOLVEMENT

The Marine Advisory Program is responsible for coordinating its efforts with all members of the State University System of Florida. Six of the nine members are already conducting Sea Grant research, yet all have faculty who address marine affairs. By referral of problems to the best qualified researcher at any of the state universities we can draw upon a broad talent base. Also, exposure to field situations stimulates increased interest in applied research.

University professors have been drawn into various local seminars on estuarine pollution, canal and housing development, and coastal planning. These activities are organized by advisory agents to inform government and the general public. Also, faculty have participated with advisory personnel in assessing environmental impact of marine development.

Marine agents also facilitate field research of faculty, such as in the conduct of interviews of fishermen in the Keys and panhandle.

It is pertinent to note that, of course, faculty also are involved in independent advisory efforts. Many of these are individual and could be the subject of

another report, but one bears mentioning now. That is, the principal scientists involved in Sea Grant's "Estuarine Management" research area have joined forces as a group dubbed the "flying wedge." Briefly, they are trained in different aspects of marine science and provide complementary approaches to analyzing marine problems.

#### OTHER ORGANIZATIONS

The respective marine-oriented organizations in Florida enjoy close working relationships. From the outset Florida's Marine Advisory Program sought to cooperate with such agencies as the Florida Department of Natural Resources and the U. S. National Marine Fisheries Service to identify areas of responsibility and proficiency. From time to time we have had to clearly state to citizens that Sea Grant and the MAP are not regulatory nor management agencies.

An example of how the MAP has contributed to other group efforts is a meeting of Atlantic Coast Sea Grant and MAP people, in connection with the Annual Meeting of the Atlantic States Marine Fisheries Commission in Newport, Rhode Island. While no formal ties were developed, the meeting did have the salutary twofold effect of developing better understanding of individual state programs by developing communications between the ASMFC Commission and the Sea Grant/MAP people and programs in their respective states.

Probably the best example of how effective the interagency program approach can be just occurred when the Florida Sea Grant Program coordinated a conference on sharks. While MAP coordinated the

project there were unusual contributions by the Coastal Plains Center for Marine Development Services, National Marine Fisheries Service, Florida Department of Natural Resources, Office of Naval Research, and the Mote Marine Laboratory. In addition, speakers donated their time and talents from the Natal, South Africa, Shark Control Board, Daytona Beach Chamber of Commerce, University of Miami, Naval Undersea Center, Florida Attorney General's office, Florida Bureau of Tourism, Outdoor Life Magazine, and the commercial fishing industry.

Another type of cooperation has resulted in our having the benefit of the fishery methods specialists from the Georgia Sea Grant Program on two separate projects. In addition, the MAP Marine Economist has cooperated with the Mississippi-Alabama Sea Grant economists in conducting business management workshops for commercial fishermen in Mississippi and Alabama.

#### REPORTING

MAP uses several channels for reaching our audience: Sea Grant Reports which cover research progress and accomplishments; Marine Advisory Bulletins, which are more informal short instructional reports written for the lay audience; Conference Proceedings; a centrally prepared newsletter which is mailed to approximately 5000 in and out of the state; local newsletters prepared and issued by the field positioned marine agents; press releases, and educational and commercial TV and radio programs.

# **CAPABILITIES FOR SOLVING SOUTH CAROLINA MARINE RESOURCE PROBLEMS**

**By EDWIN B. JOSEPH**

*Director*

*Division of Marine Resources*

*S. C. Wildlife and Marine Resources Department*

*Charleston, South Carolina*

There has always been a great deal of interest in marine resources among the diverse agencies and groups in South Carolina. We in the South Carolina Wildlife and Marine Resources Department have, over the last five years, attempted to bring together on the same stage, so to speak, all those with interests in marine resources. By this I do not mean that we have tried to involve all in the same organization but, rather, we have tried to insure that all the elements are closely covered. Among these elements we would include the Sea Grant Program, the research capabilities that exist in all of the colleges and universities of the State, the coastal zone management process, the actual resource management process, and the research capability that exists in State agencies themselves. We also attempt to keep the affairs of the Coastal Plains Regional Commission closely tied in. All this has been rather difficult in South Carolina for several reasons, yet, I believe, we have had good success in this direction.

Unlike many of the other states, the colleges and universities in South Carolina operate as totally separate entities. We have no university system but, rather, we have six or more highly separate institutions. It was for this reason some years ago that the State attempted to put together a marine resources component within State government and to create a set of facilities on the coast which would accommodate, as far as possible, the diverse interests of marine scientists from any of the State's colleges and universities. This, it was felt, would provide them with a more adequate outlook to the sea, vessel and shoreside logistics support, and so on.

Before continuing further, I would like to say something about the structure of the Sea Grant Program in South Carolina, which probably is somewhat unusual. The Program is headquartered within a State agency, the South Carolina Wildlife and Marine Resources Department, and I can think of only one other state in the country where this is the case. However, we do not speak of anything other than a South Carolina Sea Grant Program and

this involves equal participation by components from Clemson University, the University of South Carolina, the Medical University of South Carolina, the College of Charleston, The Citadel, and the Marine Resources Center, which is a part of the State Government. With special emphasis on the advisory programs, these also have been a collaborative effort, and on a very small scale but, I believe, they have been highly successful. Dr. Popenoe mentioned that Florida was one of the newer elements of the Sea Grant Program. I think that Ed Chin and I can agree that is true, but there are two others here who are even newer. Unfortunately for us in South Carolina, we came into the Program just at the height of the budget crunch on the Sea Grant system which, thus far, has not been appreciably lifted. So, we do have a small program, but we do have high hopes for the future.

From the very beginning, the Marine Advisory Program has been tied to the Cooperative Extension Program of South Carolina. The Director of our extension program, Dr. Kenneth Roberts, who is here with us today, is officially a member of the faculty of Clemson University and a part of the Cooperative Extension Program of Clemson. However, he is housed on the coast in the facilities of the Marine Resources Center. Personally, I find this arrangement to be extremely useful. Among a few other duties, I am directly responsible for the resource management problems in the State and having Ken just two doors down the hall from me is a great deal of help to me personally and helps to insure the linkage between the research effort, the management effort, and the extension function. Within the extension program now we have only a total of four individuals, which is certainly inadequate. All are specialists of one type or another. Ken Roberts is a marine economist and gives us a good deal of experience in working with economic problems in industry. We have a commercial fisheries specialist located in Beaufort, South Carolina, which is one of the State's centers of the seafood industry. We have a coastal engineer who is also housed at the Marine Center. I think we

are all concerned with coordination these days, not only within State programs but, also, within neighboring states. The three original Coastal Plains States, North Carolina South Carolina, and Georgia, have enjoyed very close collaboration, not only among their respective State agencies but among the universities as well. This is especially true among the three Sea Grant Programs with B.J. Copeland, Ed Chin, and I in frequent contact. We are writing our proposal now and I have asked both Dr. Copeland and Dr. Chin to serve as a sort of quick internal pre-review board. We visit their programs and I would like to say that the Coastal Plains Marine Center has performed a very valuable service in helping to bring us together just as they have done in this meeting today.

Now I would like to discuss the organization and facilities of the Marine Resources Center and present some specific examples of our activities. The Marine Resources Center is located at Fort Johnson on Charleston Harbor and contains two organizational units, the Marine Resources Research Institute and the Office of Marine Conservation and Management.

The Marine Resources Research Institute serves as the marine research arm of the State of South Carolina and conducts estuarine and marine studies as dictated by the needs of State and Federal agencies and private industry. The Institute also provides physical facilities in support of marine science curricula of the State's colleges and universities.

The primary research interests at the Institute include biological, geological, and chemical oceanography, and fisheries, estuarine, and marsh studies. Major interests include aquaculture, marine and estuarine ecology, population dynamics, and fishery science. The Institute's scientific staff is comprised of 16 doctoral-level positions in the areas of biological and chemical oceanography, marine biology, fisheries biology, biochemistry, geology, and economics, and 49 support personnel, plus summer aides and graduate students.

The main laboratory of the Institute was completed in July 1972, and contains 12 laboratories supplied with artificial seawater from a central system, 2 large constant temperature rooms, a walk-in chiller and freezer, a library, and offices of the scientific staff. Construction is underway on a 30,000 square-foot addition to the main laboratory which will contain teaching as well as research laboratories, an auditorium, a library, a computer

terminal, and spaces for graduate students and visiting investigators. Dormitories and an enclosed boat area are to be constructed in the near future.

Three smaller buildings at Fort Johnson have been modified to house a geology laboratory, a finfish and shellfish taxonomic work-up facility, and an aquaculture project. Shop facilities are maintained to provide some instrument maintenance and fabrication.

The Institute's research vessels include the R/V DOLPHIN, a 107-foot oceanographic ship; the R/V ANITA, a 55-foot shrimp trawler designed for inshore and estuarine survey work; and the R/V CAROLINA PRIDE, a 50-foot combination inshore-estuarine trawler and diver support vessel. Several smaller inboard and outboard craft are operated by the Institute.

One of our projects is attempting to reverse the very drastic decline in South Carolina's oyster industry. The oyster industry here has been phased almost exclusively on intertidal oysters and we are trying to stimulate the growing and harvest of subtidal oysters. We are also involved with shellfish disease problems and, through support from the State and Sea Grant, we are investigating shellfish culture in some of the many impoundments in South Carolina. We feel that, if we can achieve better salinity control in these impoundments we can realize increased growth and control some of the disease problems known to be salinity related.

We have a very heavy interest in crustacean mariculture. Dr. Paul Sandifer heads a multi-institutional group working on culture of the Maylasiatic prawn, Macrobrachium rosenbergii, with support from Sea Grant, the Coastal Plains Regional Commission, and the State. We have gotten into the state of pond grow-out over the last few years and, I think, have had considerable success although there is still much work to be done.

We have a very active program creating and maintaining an adequate data base for the estuaries in the State. This activity is supported by the State and the Coastal Plains Regional Commission. Included in this baseline research are biological, physical, and chemical parameters.

We also are involved in work on the National Marine Fisheries Service's Marine Resources Monitoring and Prediction Program (MARMAP) and since the inception of this program we have been the contractor for what we refer to as the "Carolinian Sea" from about Wilmington, North

Carolina to Miami, Florida. Early in this program we were concerned mainly with plankton, but we are now looking in more detail at the benthic resources on the continental shelf from about Cape Hatteras to Cape Canaveral.

The other component of the Marine Resources Center, the Office of Marine Conservation and Management, is headquartered in the main administration building at Fort Johnson. This office is directly responsible for the management of the

State's marine resources. In addition, the management biologists are engaged in several areas of research, in most cases in cooperation with the staff of the Institute. They are involved in work on marine game fishes; artificial reef development, monitoring, and assessment; commercial and recreational fisheries management; environmental surveys and evaluations; licensing; leasing of shellfish areas; and fisheries statistics.

# INTERACTION BETWEEN RESEARCH AND EXTENSION IN THE GEORGIA SEA GRANT PROGRAM

By EDWARD CHIN

*Director  
Sea Grant Program  
University of Georgia  
Athens, Georgia*

The traditional role of extension is to disseminate information to the people. The dissemination of information, as far as we are concerned, goes in many directions. It goes to the public; it goes to the State and Federal agencies that ask for various types of information; it goes to industry; and it goes to the National Marine Advisory Services network, which Bob Shephard described this morning, and through that mechanism and the other Sea Grant programs, information goes to other Sea Grant programs and to their clientele. Information flows both ways; it flows from State and Federal agencies to us as well as from us to them, so it isn't a unidirectional type of flow.

In Georgia we find that marine extension seems to be assuming the role of an onlooker with respect to Federal and State regulations. I'm sure that this is true in other states as well. This is exemplified by the current problems with waste disposal with which the seafood processing industry is wrestling. In Georgia, the State regulations concerning waste disposal are more stringent than those of the Federal Environmental Protection Agency (EPA). So we find ourselves going through the different regulatory agencies with the processing industry explaining their needs and that type of thing. Here I should acknowledge that we are being assisted by the Coastal Plains Regional Commission and the Coastal Plains Marine Center who are helping us to hire a marine extension agent who will be primarily devoted to assisting processors with their waste disposal problems.

Another example of information dissemination occurred about a year ago when, as you will recall, we had a fuel shortage. We had to go to the shrimp fishermen in Georgia and explain to them that they were indeed eligible for fuel. Many of them did not know that regulations entitled them to a supply of fuel and even people who sold fuel did not recognize that shrimp fishermen were entitled to buy fuel. So, without really asking for it, we became the center for fuel complaints and we in turn worked with the Federal people in Atlanta. As a result, not one of our shrimpers went without fuel during the fuel crisis.

Now, as I said, the traditional role of extension programs is the dissemination of information but, quite frankly, we just don't have all that much information to disseminate. We get a lot of help from other State and Federal agencies and from industry and we transmit this information, so we need this service.

For the next few minutes I would like to discuss the interaction between research and extension in Georgia. We find it to be most effective to work with the State and Federal agencies, industry, and the public to actively define the problems, to identify the problems, and to pass them on to the appropriate unit within the university system for study. It is not always an easy task to get people from the academic programs to work on these problems, and sometimes we have to beg for their help. There is a great deal of research, also, that is actually done by our marine extension people and here we may be a little bit different from some other operations such as those in Virginia and Florida. Our extension people actually have to do research to answer some of the questions that they find in the field. I would like to give you just a few examples of the types of research conducted by marine extension people and the various units in the University.

One of the major problems, as I have already mentioned, is the disposal of waste products by the seafood processing industry. Heretofore these waste products have been dumped into coastal rivers and estuaries without any concern for the effects. With the current regulations governing waste disposal the seafood industry faces several alternatives. A company can build and operate its own waste treatment plant; several companies can build a joint treatment plant and run it cooperatively; or a company can pipe its wastes into a municipal sewage treatment plant at a cost which can be considerably high. We have a project underway in which we are using an actual processing by-product to treat wastes. The by-product is chitin and it can be prepared from shrimp hulls or hulls of other crustaceans such as crabs. It is being prepared currently on the west coast and we



have used that in our experiments. We actually use it to treat the processing effluent which contains a large amount of suspended materials. We clarify the treated effluent and the suspended materials coagulate and we end up with a sort of sludge. However, even though we have cleaned up the effluent we still have the problem of what to do with the sludge that remains. So far we have been feeding it to rats and chickens to determine what type of nutritional benefits it might possess.

We have another problem in how to use the currently underutilized fishes that are abundant throughout Georgia's coast. Solving this problem requires tremendous effort. Two such underutilized species are mullet and spanish mackerel which are very abundant in Georgia. We have developed smoked products from both these fishes which, I might add, is not the easiest thing to do since they must meet Food and Drug Administration Standards so that the product can be shipped in interstate commerce. After developing these smoked products we had to conduct certain consumer acceptance studies. These were run right here in Savannah with the help of the National Marine Fisheries Service and the Florida Department of Natural Resources who, fortunately, have specialists in Atlanta who were able to assist. So we did not need to develop this expertise in our own program. We also conducted demonstrations of the products in Brunswick and Atlanta. After having demonstrated that the product was good, we worked with DuPont to develop packages.

A few months ago, we had a marketing demonstration of these smoked products in Atlanta. The interesting thing about this is that we found you can't show a product unless it is actually for sale. We were fortunate enough to talk a company into going into business. They established a trademark and took orders for the products right at the show.

Another project in which we are involved is a survey of the distribution and abundance of sand and gravel resources along the Georgia coast. One reason we need this survey is the large distance between the coast and the nearest center for obtaining road building material. The largest cost of road building material is in its transportation. We have surveyed what we have in the coastal area and the next thing is to test these materials for their suitability in building roads. This particular study is being transferred from Skidaway Institute, where Dr. James Harding was responsible for the initial exploratory study, to Georgia Institute of Technology where the actual formulation of different types of aggregates is being done.

We have put a tremendous amount of effort into our work to increase the fishing efficiency of our fleet. Since the oyster industry has gone downhill, about the only real fisheries industry we have is the shrimp industry. The traditional method of catching shrimp is the double-rigged trawl, that is, fishing one net off each side of the boat. We have taken ideas from fishermen in the Gulf of Mexico shrimp fishery and, combined with some of our own ideas, have developed a method of twin-trawling which uses four nets. Each net is smaller than those normally used in the double-rigged trawl. They are cheaper to build and they seem to be from 15 to 35 per cent more efficient. The heart of the system is the trawl doors, one on the outside of each net and a "dummy" door between the two nets which serves as a common door.

One of the shrimpers who has switched to the twin-trawl was the number one producer in Georgia last year. Before the change the best he ever did was fifth. Not only are the nets more efficient, but also their use results in considerable fuel savings since they are easier to drag.

Another of the problems in the shrimp fishing industry is the "cabbagehead" or jellyfish. They are often so numerous as to clog the trawls and make fishing impossible. Our people have been experimenting with separator trawls designed to remove the jellyfish from the shrimp in the net. The heart of this system consists simply of a hole near the back of the net with a "shunt" or panel of netting through which the shrimp can pass but which directs the larger jellyfish out the hole. In one test in which we fished the experimental net alongside a conventional net, the experimental net caught 80 pounds of shrimp with no jellyfish while the conventional net caught 85 pounds of shrimp with many jellyfish.

Along with all this we have a training program to teach our fishermen how to build and mend nets. Sometimes we do this in a one-on-one fashion and sometimes we do it in small groups. We teach fishermen how to build doors, how to set the chain through the door properly, and how to splice wire. This not only saves the fisherman his money but also makes him more proficient at sea. We teach simple safety precautions and we even teach them how to use navigational gear. At a time when most of the country is talking and arguing about the merits of Loran C, most Georgia boats don't even have Loran A. There are a few fishermen who are not familiar with radar and, although most of our boats have radar, we still find that we have to teach many fishermen how to use it.

# SEA GRANT RESEARCH AND ADVISORY SERVICES IN NORTH CAROLINA

By B. J. COPELAND

*Director*

*The University of North Carolina Sea Grant Program  
Raleigh, North Carolina*

Among the Coastal Plains States, North Carolina has a unique coastline and coastal environment. Bordering on the Atlantic Ocean are some 350 miles of barrier islands. Referred to as the Outer Banks, this narrow strand of beaches and dunes protrudes east into the ocean at Cape Hatteras and turns westward at Cape Fear. Behind the Outer Banks are about 2.5 million acres of sounds, estuaries, marshes and tidal creeks. This large area provides a variety of marine resources, uses of which are often in conflict.

The University of North Carolina Sea Grant Program is dedicated to providing the technological and informational base upon which management, conservation, and utilization of these resources can be developed. Through research, advisory services and education, we are developing information on the University campus with a multidisciplinary approach and putting it to work at the user level. Although restricted by the availability of funds, we are directing our efforts to three areas: (1) management of the coastal area, (2) environmental quality, and (3) food from the sea.

## MANAGEMENT OF THE COASTAL AREA

With the passage of the Coastal Area Management Act in 1974, the State of North Carolina embarked upon an ambitious program designed ultimately to manage and regulate development in the coastal area. The University of North Carolina Sea Grant Program, which was already involved in developing the technology and information necessary for coastal area management, was called upon to direct its research, education, and advisory programs to coastal area management problems.

There has been a critical need to provide information on shoreline erosion rates, both on the inner side of the barrier islands and along the inner mainland shores. Work is underway to assess erosion rates along the inner mainland shores, to provide an analysis of the forces acting upon shoreline stability, and to determine geologic and biologic processes influencing erosion. Results from this research are already being put to use as a basis

for alternative methods of coping with shoreline erosion. Such information is needed for adoption of realistic set-back lines and rational regulation of developmental activities along North Carolina's shores. Work is nearing completion that will provide the technological details for stabilizing shorelines with vegetation. Transplanting smooth cordgrass, the dominant vegetation in regularly flooded salt marshes, has been shown to be effective in combating erosion on some shorelines.

Since coastal area management in North Carolina is to be based on sound ecological principles, it is necessary to develop a detailed knowledge of the different types of ecosystems present on the North Carolina coast. The Sea Grant Program was called upon to direct its multidisciplinary approach toward providing scientific information on ecological processes at work in various types of shore environments in the context of existing regulatory alternatives. This work, nearing completion, is designed to coincide time-wise with the implementation of North Carolina's Coastal Area Management Act. Sea Grant is providing an understanding of the interactions between the complicated ecology of the coastal zone and various use alternatives. This should provide State coastal area management agencies with information needed in planning and drawing up regulations necessary for realistic coastal management.

Legal and jurisdictional questions concerning management actions and the State's jurisdiction over land and waters are particularly acute. Sea Grant legal researchers are responding to questions as they arise, particularly concerning the legality of how counties and municipalities plan for land use outside designated areas of environmental concern. Closely related to this are research and advisory activities in developing land use plans and providing information on techniques for land use planning. Work is underway to develop the means of applying existing technology to develop a usable land use mapping system based on remote sensing and aerial photography.

Through advisory services and various communications media, Sea Grant continuously

provides expertise and information concerning various aspects of coastal area management in North Carolina. Citizens, planners and governmental agencies rely on the multidisciplinary approach developed through Sea Grant to provide the technological and information base upon which rational use decisions can be developed.

#### ENVIRONMENTAL QUALITY

North Carolina's vast coastal area is continuously under pressure from various commercial, developmental, and industrial activities. The quality of the environment that makes these areas attractive is threatened by such activities. Thus, maintenance of the aesthetic appeal and of maximum productivity relies upon the development of environmental quality programs of maximum efficiency. A priority area for Sea Grant research and advisory services is to develop the information base necessary to assure the maintenance of the quality of estuaries, sounds and marshes, as well as the Outer Banks, and to provide the basis upon which an effective and comprehensive environmental quality management program can be enacted by the State.

Sea Grant joins several other programs under the auspices of Federal and State agencies and universities dealing with environmental quality. To seek solutions to these problems, research is underway in the productivity, use, and value of marsh ecosystems. Work is nearing completion on determining importance of marsh grasses for the production of estuarine organisms which contribute to the regulation of fish production, and the role of bacteria and other microbes in the salt marsh food web. Along with work being conducted by the National Marine Fisheries Service Laboratory at Beaufort and the North Carolina Division of Marine Fisheries, Sea Grant research results will form the information base upon which judgment can be made concerning man's activities inside and on the fringes of marshes.

Coastal bird populations serve as barometers of environmental quality and provide considerable aesthetic appeal. Research is underway to develop accurate census techniques for use by the State in monitoring coastal bird populations. This, in conjunction with work already completed dealing with the utilization of spoil islands for nesting by coastal birds, will complete the necessary baseline for development of policy and regulations concerning wildlife and bird habitats in coastal North Carolina.

With the increasing density of people and activities along the Outer Banks, disposal of sewage through offshore pipelines has become a considered alternative. Research is underway to determine complexities of nearshore and offshore mixing and dispersion so that the viability of this alternative can be assessed. Sea Grant has joined with other agencies to provide an extensive data base designed to provide adequate information for evaluation of the North Carolina continental shelf for several aspects of resource development and waste disposal.

About 700,000 acres of North Carolina estuarine waters are closed to commercial shellfishing because of high bacteria populations. Causative agents for high coliform counts are not known, nor do we understand the relationships of this standard to the real problem of enteric viruses and the means of controlling those viruses. We are initiating work to investigate the methodology of measurement and pathogen assessment so that more realistic evaluation of viruses and pathogenic bacteria can be made.

One of the more perplexing problems of environmental quality in coastal waters is related to the percolation and flow of materials from land use activities, such as nutrients and pesticides, and their impact on the adjacent estuaries and marshes. We have nearly completed work on the drainage and impact of nutrients in North Carolina's estuarine waters. Recent emphasis on clearing and draining wetlands for large scale agricultural activities has raised several questions regarding environmental quality. Sea Grant in cooperation with the Water Resources Research Institute of the University of North Carolina, has initiated work to determine the relationship between drainage practices and farming activities with the output of nutrients and pesticides in receiving waters. Results from these research activities are already being utilized by the State to develop policy regarding agricultural land use regulations.

Recreation and tourism is one of the largest industries utilizing North Carolina's coastal resources, and its well-being relies to some extent upon environmental quality. Compounding recreation problems in the coastal zone is the broad spectrum of individual desires which range from the need to experience nature and landscapes in their natural state to the need to use resources primarily for commercial and recreation activities. We are initiating work to pull together existing information concerning recreational activities and beginning to put it to work in the coastal zone. Our

goal is to develop information necessary to improve the economic return from resource utilization which is compatible with environmental quality.

### FOOD FROM THE SEA

The direct value of North Carolina's commercial fisheries harvest is in the neighborhood of \$20 million a year, which stimulates an economy estimated to be worth 10 to 20 times that each year. Among the many problems facing the North Carolina fishing industry, management of nursery and fishery grounds, stock assessment, development of an efficient statistics system, product and catch quality, marketing innovations and development of viable mariculture are top priority. Providing solutions to these problems requires a large scale research effort undergirded by imagination and innovative science. A more subtle, and perhaps more important, problem is the provision of an effective advisory service and educational program for fishermen and processors aimed at helping them utilize modern technology and results of multi-agency research programs.

We have developed an active research program in seafood science and technology to provide the technological base for the development of new seafood products and use of under-utilized species. This work ranges from basic studies of the compositional characteristics of finfish products to improved blue crab processing. Closely coordinated with this work are research programs dealing with the problems of pathogenic bacteria and viruses in seafood products and work on the control of microcontaminants through processing innovations. Research in this area is closely coupled with an effective advisory services program which

puts laboratory findings to work on the water front and in the processing plant. Nearing completion is a study to determine the channels through which fresh seafood moves in North Carolina. Results from this work should be useful in developing marketing plans and improving the return to the fisherman.

Catching and marketing wild eels has become an important coastal fishing enterprise. Research and advisory activities in this area are designed to improve the fishing gear and techniques and to provide advisory assistance for handling and marketing wild eels. Recently, we have developed an eel culture demonstration unit to adapt Japanese culture methods to North Carolina conditions. Results from work completed thus far indicate that the culture and grow out of eels show great promise for North Carolina entrepreneurs. Work is now underway to improve feeding efficiencies and to prove the economics of culture conditions.

One of the more important problems in the culture of any marine organism is the control of diseases under mariculture conditions. We are taking advantage of the availability of a unique researcher in the University to provide research background and solutions to the control of fungal diseases in crustaceans and molluscs. This work has almost reached the stage where manuals on the diagnosis and control of fungal diseases can be produced.

We have developed an effective advisory and educational program to assist fishermen and processors with a large array of problems. This work ranges from workshops, to in-plant demonstrations, to group meetings, and individual encounters.

# SEAFOOD PROCESSING IN RELATION TO COASTAL INDUSTRIAL PARK CONCEPTS

By FRANK B. THOMAS

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During most of the last quarter century, we in North Carolina have heard about, discussed, and/or participated in meetings concerning the jetties and stabilization of Oregon Inlet and the potential for port development in the Wanchese Harbor area in Dare County, North Carolina. From these early discussions has arisen, in the last two to three years, the application of industrial park concepts to the fishing/seafood community. It is to this application that the following remarks are addressed.

During 1974 and 1975 the Seafood Ad Hoc Committee of the Coastal Plains Regional Commission (CPRC) addressed itself to recommendations for assisting the commercial seafood industry. Five prime areas of focus were delineated:

1. Harbors, Docks, and Related Facilities
2. Federal Regulations
3. Marketing Development and Enhancement
4. Education and Training
5. Availability of Capital

This committee did exceedingly well as in nearly 18 years of extension effort these have been problems of frequent recurrence. As we look at our charts along the South Atlantic seaboard, we find from Hampton, Virginia to Florida, areas where the seafood industrial park could be developed. Wanchese Harbor, in North Carolina, may be the leader, and Oglethorpe Bay Landing, in Georgia, second. Who will be the third, fourth, fifth, etc.? We need to plan now for the next twenty-five years.

Some basic requirements to be considered in planning for seafood industrial parks, and some of the concomitant benefits, are outlined below. These include:

1. Adequate deep water access, channelization, and stabilization should be provided using natural systems where available and man-made systems when natural systems are lacking.
2. Sufficient land area should be available for all primary and secondary needs. Also, adequate transportation facilities, utilities, labor resources, etc., should be available.
3. Industry likes to go where basic facilities such as parking, utilities, bulkheading, docking, fire protection, fuel, ice, ship stores, gear, engine, and electronic repair facilities are provided. We must bear in mind that many shore necessities are not income producing. However, consolidation of goods and services can reduce capital expense for items such as those mentioned. States and/or municipalities can act on an impartial basis yet provide only the basic facilities, thereby reducing much duplication of effort.
4. Higher quality products can be provided. The shortest time possible between harvest and consumption tends to promote better product quality. Adequate fast handling facilities, short boat turn around time, easier fishery product inspection, and maintenance of high sanitary standards will attract buyers and processors.
5. Solid and liquid waste disposal can be consolidated without impairing the environment. With sufficient volume of solid wastes from fresh fish, meal reduction plants become feasible, and, thus, reduce dependence on sanitary land fills for waste disposal. Appropriately designed treatment plants for vessel discharges, wash-down water, and processing discharges can be provided in the industrial park or can be designed to be compatible with a municipal or county system. In these days of ever more stringent regulatory requirements it will be easier and less costly to meet such demands by grouping our related enterprises.
6. Adequate production tends to attract processors, and processors tend to attract processors. With sufficient volume come the satellite industries such as packaging materials of all kinds, gear, equipment, cordage, etc.
7. Consolidated freezer storage can be provided. One well managed, well designed freezer

storage unit should be more efficient and less costly to operate than numerous smaller freezers and would help to assure inventory control, aid in financing, and provide quality product protection.

8. More adequate truck transport could be attracted by providing terminal facilities for over-the-road tractor-trailer fleets to move products to distant markets in a speedy manner. Again, less handling, shorter time enroute, and higher quality are expected gains.
9. Fuel allocation could be expedited. With our recent economic pinch for fuels, the accessibility and allocation of fuels to vessels would be expedited by an industrial complex as opposed to many small distribution points.
10. Rising prices, cost/benefit ratios, feasibility studies, and long term attraction of capital are further benefits to be derived from an industrial park concept.
11. The construction of industrial parks requires close examination of resource availability. Resource conferences in 1974 and 1975 established base data for our industry in

North Carolina. Local, regional, national, and international aspects need to be examined.

12. During 1975 the North Carolina State University Seafood Laboratory and members of our seafood groups from the university campus worked in detail on "Seafood Processing and Marketing in the Coastal Plains Area." A work shop was held at the conclusion of this study and a proceedings was published. There is an array of valuable material in the ten sections of that report to assist in placing seafood processing and the industrial park concept on a totally feasible basis.

The seafood industrial park can provide opportunities to assist fisheries cooperatives, fisheries associations, municipal and state governments, and increase our utilization of proteins from the sea while reducing waste.

This will take team effort, but the concept provides a remarkable opportunity for technologists, engineers, planners, financiers, economists, developers, and others to work together. The array of disciplines required is not staggering, but all their many areas of expertise are required for a well planned, well executed, and viable seafood industrial park to become a reality.

# WASTE DISPOSAL IN SEAFOOD PROCESSING: PUBLIC OR PRIVATE?

By **RONALD M. NORTH**

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The title of this Session, "Seafood Processing: Technology and Economics," gives one great latitude in the choice of subject matter for discussion. Since there are no one-handed economists, all economists deal on both the one hand and on the other hand, and since economists like to deal in two dimensions, i.e., in production and consumption, buying and selling, saving and spending, normative and positive, perhaps we can extend these deals to include goods and bads, products and wastes, or especially, publics and privates.

Seafood processing does include the problems of waste disposal, negative products or bads, as well as the more familiar production and marketing problems associated with harvesting and processing a marketable economic product or goods. I wish to focus our attention on the negative products of seafood processing, or the waste disposal problems, which are becoming an integral part of both the technology and the economics of seafood processing.

I wish to make some general points about the economic aspects of waste disposal in general and the uniqueness of waste disposal problems in the applications of economics. We should also discuss the particular solutions being developed to integrate waste disposal into the seafood economy to meet changing societal requirements for environmental quality. The solutions, which solve waste disposal problems, may not be altogether technological. We can rest assured that the best solutions will not be all hardware. The effective and least cost methods of achieving environmental quality may lie largely in the social, economic, legal, and other institutional areas where technology is not so easily defined.

Waste disposal may be termed as an economic bad. Our entire economic system of supply and demand models and theories is based on achieving an equilibrium in the production and consumption of goods as saleable products and services, i.e., the things people want and are willing to pay for. Most of these goods, and some services, have traditionally been provided largely by the private sector while

many services such as defense, education, and transportation have been provided, or heavily supported, through the public sector. Let's be more specific. In the seafood industry, as well as in most other industries, our market orientation provides sufficient incentive for us to keep the quality of our products high and the front doors shiny. We have not developed the cultural status, nor the economic incentives, to voluntarily maintain the quality of the environment nor to voluntarily keep our back doors equal to the front.

I think this analogy is appropriate because we universally sneak our waste products out the back door, it's human nature to do so. We always wish to get distance between ourselves and our wastes. We discharge wastes so as to remove them from our responsibility. Often this action imposes direct costs on third parties, or indirect and hidden costs on society. There are occasions when such waste discharges generate benefits, rather than costs, for either third parties directly, or for society. One of our responsibilities in this matter of seafood processing is to develop both technical and institutional processes which convert wastes, or bads, to products and resources or goods.

To set the stage for our economic analysis of waste disposal in the seafood industry, let's first look at what waste disposal is. Waste disposal is a process ridding ourselves of unwanted resources. The results or outputs of waste disposal have traditionally resulted in "pollution." We define pollution as the unfavorable alteration of our environment, either naturally or at the hands of man. There are several important economic implications from these definitions. First, the nonquality, or the waste perceptions, of effluents or the more familiar corresponding perception of the quality of the water, into which wastes are usually discharged, are, to a large extent, a matter of opinion, economically, if not technically. The perceived intensity of the resulting pollution problems from waste disposal varies among groups and individuals relative to their wealth and knowledge and location, and relative to the

importance attached to the causal activities. Sociologists would describe this as a kinship function in which the greatest distance results in the least personal concern. In fact, when waste discharges are given time or distance, they are more likely to be perceived as resources.

It is these kinds of attributes with which we view wastes which require special kinds of solutions, or combinations of solutions, that are not necessarily technological nor hardware oriented. This tendency to look only for hardware type solutions is no respecter of disciplines. Economists and political scientists, as well as businessmen and politicians, would rather develop a new treatment process than change an institutional arrangement. We find ourselves in two basic positions with respect to waste disposal problems. First, we make every possible effort to transfer the waste from our immediate concern. Secondly, we will spend any amount of money and resources to develop a piece of hardware, or a mechanical means, to dispose of, or convert, wastes.

Our most frequent solution for waste disposal is to transfer the problem to society, to the public sector, to another jurisdiction, or into another form. When we discharge effluents to rivers or estuaries, or even to municipal sewers, we are transferring our waste disposal, and any associated financial or social costs, to third parties. Since very few people in the private sector find any positive reward or incentive in owning waste, there results a considerable public interest in waste disposal.

This public interest in waste disposal often results in counter attempts to transfer the burdens of waste disposal from the public to the private sector. In fact, the most favorite proposal in the public sector to solve our waste disposal problems is to pass a law against it. This solution seems to be morally correct to many people, even if it is technically or economically disastrous. Proponents of outlawing pollution, especially that caused by industries and corporations, reason that waste disposal despoils and degrades nature, that it is evil and therefore should be forbidden by fiat. Such approaches tell us what we cannot do and tend to leave the real solutions to the imagination and resources of the private sector.

One can quickly see the circuitous nature of the efforts to always transfer waste disposal problems to another party, business and industry to the environment, (actually to society), the environment to the public, and the public back to business and industry, either by fiat or by user charges and taxes. Since firms and publics can so often effect transfers

of certain costs and responsibilities of their production and consumption outside their immediate market interest, we have produced an externality, or an economic impact, which is not reckoned with by firms in their production and consumption decisions.

The concept of externalities is one that is often maligned by fellow economists and laity alike. Alfred Marshall once described such economic concepts of supply and demand as being like scissors, i.e., consisting of two blades both of which are necessary to do any cutting. The common approach to environmental concerns is to consider only one side of the question, frequently the bads or the diseconomies. But the concept of externalities includes goods and bads. Externalities result in both economies and diseconomies. Economies are the beneficial effects of economic activities not captured by the market. Diseconomies are the equivalent adverse effects which lie beyond the immediate concern of the firm or of the consumer.

The complexity of externalities is such that one must illustrate in order to define. An at-home example will serve our purposes. If a processing plant discharges nontoxic, or limited, wastes into the estuary, the Spartina and other organisms flourish, converting the nutrients to food and improving the fishery. In this case the processing plant has transferred its waste to society beneficially, both to itself and to society and everyone enjoys external economies.

However, let this same waste discharge be excessive or contain toxins and while the processing plant continues to enjoy external economies, the society at large, and specific publics, such as shrimpers, suffer the social and economic costs imposed externally and directly by the processing plant. A part of the external costs are imposed indirectly by the consumers of the processed product, who now do not pay the full costs of their increased demand. So it is that any specific economic activity may be either beneficial, adverse or neutral with respect to third parties depending on time, place, intensity, physical-chemical-biological-climatic circumstances and other factors.

A rational economic analysis would let the market provide the necessary adjustments through such mechanisms as prices and contracts and occasionally even litigation and ostensibly achieve the most optimum, or the least inefficient, solution to the waste disposal problem. But such nebulous and uncertain relationships or externalities are the grist of political motivations which arise from both real and imagined injustices. So we have a large



measure of public or governmental intervention intended to provide instant redress for some ill-defined external diseconomies.

These adverse externalities, or diseconomies, invite governmental intervention on behalf of the public. However, direct government intervention is not the only solution. Market agreements and contracts among affected parties can be worked out in the private sector when the elusive externalities are identified and quantified or when technological developments can be applied to create a desirable use for seafood wastes.

The role of economics in this process is to first identify the alternatives and their benefits and costs so that appropriate combinations of solutions can be developed. These solutions must maximize first the internal economies of waste disposal and secondly, the external economies while minimizing the external diseconomies. You recognize, of course, that this role as described here is that of attaining efficiency in waste disposal.

The concurrent role of economics in solving waste disposal problems is that of achieving equity. In the private sector, when dealing with internal economies, the market forces define equity in terms of prices so that each beneficiary pays the full cost of his demands. In the case of seafood processing each consumer of seafood would pay the full cost of the product to include the costs of waste disposal.

However, when externalities must be dealt with, we have severe problems of equity in the strict economic sense of beneficiaries paying the full costs, or receiving the full benefit of resources provided. This problem becomes more acute when the public sector or governmental entities enter the fray because two things happen. First, alternatives are severely restricted with a corresponding loss of efficiency and secondly, the problems of equity, or who pays, are not necessarily addressed at all. At this point all external diseconomies and some easily internalized costs are transferred to taxpayers with great losses of economic efficiency and very little recognition of economic equity. Costs are now largely prorated on the basis of incomes or property ownership. The products of clean water or environmental quality thus produced are made public goods.

Only in rare, but fortunately increasing, cases are the major costs of waste disposal internalized to users in proportion to either cost burdens imposed or benefits received. Now that the great overreaction to the environmental crisis of the last ten years has abated and the economic man of A. Smith has resurfaced without the crisis role of great morality,

we can begin a serious search for good answers and workable alternatives. The many laws passed since 1956, and since interpreted without any thought of consequences, are being amended and reinterpreted. These amendments are not so much from the point of view of punishing the evil of waste disposal, but are based more on the premise that there is an increasingly scarce economic good called environmental quality, or specifically water quality, that different people want to use in different ways.

Now we can see water quality in terms of a scarce resource to be managed and allocated both efficiently and equitably. Once waste disposal is viewed as a scarce resource, the price system should be used increasingly often to achieve the best results. What we are saying is that there are three major factions vying for water quality and each should pay for the respective uses in accordance with the values or benefits received from those uses. First there are those who use water quality as a basic productive resource for fishing, irrigation, and navigation. They should pay for the quality demanded. Secondly, there are those who use water quality only as a sink for waste discharges, and they should pay for the use of this water quality, either its direct value, or a surrogate value for its reduction in quality. Then there are those who use water quality only as an object of enjoyment, or wish to reserve water quality for its intrinsic value. Those who wish to enjoy or reserve water quality should also pay an amount appropriate to the values received. However, until such time as the values, contractual arrangements, and procedures can be worked out for a greater economic role in allocating water quality, we will need to continue to adjust governmental management of water quality as a public good.

We have certain precedents in this transition of a natural resource, once free, but later scarce and wanted by many. This would include land which transitioned from a public to a private resource in Europe in the 12th to 15th centuries and from a free status to a public status to a private status in North America from the 17th to the 19th centuries. We can see this gradual progression of events in water quality. Although we may never reach the levels of private transactions in water that have been reached in land, considerable strides have been made in areas like the western states where scarcity is a real factor and water rights are appropriated and traded.

Additional evidence of shifts to more economic solutions to maintain, or improve, water quality are to be found in the increasing application of user

charges to effluent discharges, recreational user fees, and the forthcoming user charges on navigable waterways, which will very likely be a surrogate charge in the form of a fuel tax. I should also point out that water quality legislation has often been helpful as an interim solution to producing water quality by forcing both technology and economics on otherwise unwilling actors. For example, a few years ago the Georgia Environmental Protection Division (formerly the Water Quality Control Board) would not even listen to a proposal, much less permit, a land disposal system for effluents on the premise that such systems were technologically inferior to trickling filters or other mechanical and chemical treatment methods. However, with the passage of P.L. 92-500 in 1972 land treatment systems suddenly became technologically feasible in Georgia and thus became an additional economic alternative to minimize waste disposal costs in certain situations. In this instance the law was used to force an institutionalized factor to change.

Another economic option provided by P.L. 92-500 was a chance given to industrial and commercial firms to internalize their waste disposal costs in one of two ways. They could capitalize and build their own waste treatment facilities to meet the effluent guidelines, or they could cost-share with a municipality receiving Federal funds for waste treatment plant construction by paying an economically justified share of the Federal costs of such treatment facilities. These Federal costs are most often 75% of the construction and planning costs, except land, as now interpreted.

So industrial and commercial firms have a choice of developing a private system of effluent disposal while bearing the full financial and economic costs, or they can join a municipal system and bear the economic costs as provided by the municipality's cost recovery formula. These formulas may vary widely from simple surcharges on volume to sophisticated pricing of the effluent quality discharged. The important factor is that the existence of a choice of method is more likely to result in both an efficient, as well as an equitable, solution for the problem of seafood processing waste disposal. Such choices will permit seafood processors to internalize waste disposal costs so that the firm includes these costs in its production and marketing decisions with consumers paying the full costs eventually.

In summary of the economics of choosing public vs private methods of waste disposal, one should recognize that industry and consumer hardships would be generated in a sudden effort to force fully private responsibility for an economic process laced

with externalities. In fact, when legislation is implemented which requires a minimum or zero discharge and government subsidies are not provided, then users or beneficiaries will surely find the costs passed along. However, the immediate economic and financial burdens will fall on the producers and processors of seafood who are immediately identified with the industry. These producers and processors must make the choices between public vs private waste treatment systems and among the various technical systems available to meet the waste discharge standards. The economic factors and types of choices available to public officials and seafood industry leaders are outlined below.

## ECONOMIC FACTORS AND ALTERNATIVES AFFECTING WASTEWATER DISPOSAL IN COASTAL ZONES

### A. HOW MUCH WATER QUALITY?

1. What are the demand functions for water qualities?
2. What are the economic uses of water downstream?
3. What are the benefit-cost relationships for various levels of effluent discharge versus zero discharge?
4. What are the ecological parameters of various stream qualities?
5. What are the assimilative capacities and nutrient needs of given streams and estuaries?
6. What are the life support needs of given streams and estuaries?
7. How much water quality can we afford?

### B. WHAT INSTITUTIONAL ARRANGEMENTS ARE REQUIRED?

1. Should organizations for wastewater management be local only, or river basin or estuary?
2. Should legal systems be redefined to increase responsibility for waste disposal?
3. Should permits be issued for variations in effluent or stream standards?
4. Should stream standards be considered in lieu of strict effluent standards for certain locations and industries?

### C. HOW SHOULD THE WATER QUALITY LEVELS ADOPTED BE PAID FOR?

1. Should costs be internalized by law so that users pay (i.e., an absolute zero discharge)?
2. Should effluent taxes and fees or should

general assessments be levied for wastewater disposal?

3. Should water supplies be sold with surcharges for waste disposal?
4. Should subsidies from general funds be continued so we can avoid direct responsibility for waste disposal?

Source: Ronald M. North, "Economic Implications of Coastal Waste Disposal Alternatives," Proceedings of The Southeastern Conference on Water Supply and Wastewater in Coastal Areas. Water Resources Research Institute, North Carolina State University, Raleigh, 1975.

The first question to answer is: What is the demand for water quality? So far our demand perceptions for water quality have been rather demagogic, ranging from complete disregard to dreams of pristine waters. Very little is known about the real economic demand for water quality in terms of how much processors (dischargers) can supply and consumers will buy at various price levels. Unfortunately, even though the analytical techniques to develop at least workable water quality demand and supply functions are available, nothing has been done. The focus has remained at the emotional levels of all or nothing, which is most costly to processors and consumers. We have inferred that dischargers (processors) would be the suppliers of water quality by relating effluent treatment costs to the levels of effluent discharge. The supply schedule for water quality is derived from treatment costs in much the same manner as a supply curve for wheat is derived from cost of production functions. However, one could perceive of the supplier of water quality as being the government in the interest of supplying a needed public good for the same reason that governments provide other public services such as schools or roads. We do estimate these costs and demands and make efforts to supply reasonable amounts relative to marginal costs.

Briefly stated, our water quality supplies range from that of unlimited discharge of effluents into our watercourses where all costs are external to the pristine or rainwater effluent standard. In terms of economic costs, we can minimize individual or internal costs by unlimited effluent discharges which result in unknown social costs or, we can internalize all costs by demanding private or public treatment to at least drinking water standards at rather high direct costs and minimum social costs. The correct approach to the question, "How much water quality?", depends on a consolidation of

much knowledge of the relationships among waste treatment levels, stream quality results, and downstream water uses.

Even though water quality standards are usually based on technological parameters such as biological oxygen demand, (BOD<sub>5</sub>), removed or dissolved oxygen, (D O), levels maintained, the correct approach should be based more on ecological parameters such as primary productivity or diversity indices when these dynamics are more fully discovered. When effluent standards are defined and maintained for ecological rather than technological parameters, then we will be achieving a true economic efficiency for a market system in which all costs are internalized. There should be no externalities or social costs related to wastewater disposal when such ecological standards are met with consumers paying the full costs of waste disposals resulting from their consumption.

An example of viable alternatives for stream standards has been proposed in a study of the Delaware Estuary (Table 1). In this study various technical alternatives were proposed to maintain dissolved oxygen from 2.5 ppm DO to 7.5 ppm DO. The costs for various standards in the Delaware Estuary are estimated to range from a low of \$12-70 million for a range of 2.5 to 4.5 ppm DO with simple, instream reoxygenation to a high of \$130-460 million for uniform, conventional waste water treatment methods (Herfindahl and Kneese, pp. 334-356).

Table 1. Estimated Costs of Various Combinations of Waste Treatment Systems for Projected 1975-80 Wasteloads in the Delaware Estuary

Objective Set No. a/	Conventional Treatment Methods c/				
	Dissolved Oxygen Level	Uniform Treatment	Zoned Treatment	Cost of Minimization	Collective Reoxygenation System b/
	PPM-----million dollars#-----				
1	4.5-7.5	460	460	460	70
2	4.0-6.5	315	250	215	40
3	3.0-6.5	155	120	85	12
4	2.5-5.5	130	80	65	12
5	1.0-7.1	d/	d/	d/	d/

a/ Provides for 92-98% BOD<sub>5</sub> removal for all waste sources for all programs and includes instream aeration in critical reaches.

b/ This method limited only to maintaining DO levels and does not consider other water quality parameters. It is also partial in that stream quality upstream or reoxygenation facilities would be lower than with waste treatment.

- c/ These waste treatment methods provided for 7 other water quality parameters including chlorides, coliforms, turbidity, pH, alkalinity, hardness, phenols.
- d/ Estimates not available. This objective would be to maintain 1964 conditions without further degradation.
- # These costs are system costs based on a 20-year plant life at a discount rate of 3 percent.

Source: Orris C. Herfindahl and Allen V. Kneese, Economic Theory of Natural Resources, pp. 340-347.

The objective, economic choice must be made with respect to the expected marginal benefits and marginal costs for the most efficient solution. For the Delaware Estuary, this would occur at about 3 ppm D O level with less than 90% BOD<sub>5</sub> removal. An administrative or subjective decision to maintain a given minimum DO level such as 3 ppm leaves one with only the choice of the least cost solution to maintain that standard. For the Delaware Estuary this reoxygenation would cost only \$12 million to achieve the same results as uniform, conventional waste treatment at a cost of \$155 million for 3.0 ppm D O minimums.

Buy why do we spend \$155 million to do a \$12 million job? The answers are found in our questions of what institutional arrangements are required for an effective wastewater disposal system and of who will pay for the system. First, we do not have sufficient legal authority nor political initiative to adopt a system of reoxygenation which displaces the imagined local control over wastewater treatment and discharge. Furthermore, we are most reluctant to propose such institutional flexibility outside academic reports. Secondly, we have been happy to accept Federal subsidies, which began in 1948 and, which have grown with increasing largess, for inefficient methods because we innocently believe the Federal Government is paying 75% of the capital cost. All we have to do is contract for a conventional, off-the-shelf, treatment plant, and directly avoid any institutional innovations. The more serious economic implication of these policies is the misallocation of resources by subsidizing the most polluting industries and governments.

However, the equally serious economic consideration is the choice of DO level to maintain. What is the needed DO level in southeastern estuaries where seafood processing wastes are discharged, and over what area should given DO levels be maintained? The data for the Delaware Estuary clearly show that costs increase more than

100 percent when the minimum DO level is increased by 33% from 3 to 4 ppm. Do the benefits provided by maintaining 4.0 DO rather than 3.0 ppm DO outweigh the added cost, regardless of the technical treatment systems installed?

The choice of the economically efficient water quality levels is not proposed as an easy solution. There are many gaps in the information base and even some tough considerations on conceptual grounds. The appalling things about our present approach is that we are doing so little with what we already know about these functions and we are choosing to ignore good, efficient solutions simply because of personal and institutional biases. There is really not much point in developing institutional arrangements and pricing-payment schemes unless more recognition is given to achieving some level of economic efficiency for disposing of seafood wastes.

This all-important question of how much water quality is one which significantly affects the choice between public vs private routes to obtain any given water quality. If in fact consumers choose to maintain water qualities provided by a no-discharge standard, then the costs would likely require heavy subsidies from general funds and would mean that processors would be forced to consider only public waste treatment systems. Lower but acceptable standards would mean more likely choices between public and private systems with opportunities for private or cooperative waste treatment systems which would be most efficient.

Regardless of the water quality parameters chosen, or the technical means to achieve them, the seafood processing industry faces two basic choices in meeting the proposed effluent standards, either discharge to a municipal system or construct private treatment facilities. In the first choice, the firm must cost-share with the municipality both construction and operating costs if such municipal facilities have received recently, or will receive Federal funds for waste treatment works. This means that contracts must be negotiated between the seafood processing firm and the municipality. Such contracts must allocate treatment facility construction and operating costs, including collector systems, to the using, processing firm.

These allocations may be negotiated on several bases or combinations. Depending on the sophistication of the negotiators, the data available to them, and the treatment plant design, widely varying rules may be established. The cost allocation may take one or some combination of the following forms:

1. Allocation of construction and operating (OMR) costs on the basis of proportional waste loading (BOD, TSS, TDS, etc.),
2. Allocation of costs on the basis of proportion of total effluent (gross volume),
3. Charge per established rates or by adding sewage surcharge to water bill,
4. Require using firm to construct some capital items such as collection system and screening and share treatment plant capital and OMR only.

The principal basis of this choice would be to investigate the financial (cash flow basis) implications of the private construction of wastewater treatment facilities on the processing firms, given their existing technological state in wastewater treatment systems, expected effluent standards, residuals recycling and capital markets. It is the combination of total costs and total expenditures which must be considered by the firm in its decision to use municipal waste treatment facilities or to construct its own private system.

Additional, nonfinancial factors in this decision would include such considerations as the length and security of the contract with the municipality and any additional constraints, delays or nuances expected in negotiating a suitable contract. The firm must also make its own evaluation of relative risks between the two alternatives. These risks include those of escalating municipal charges, escalating construction and OMR costs, and the firm's ability to manage effectively the treatment system to meet effluent standards and to avoid penalties or litigation over a malfunctioning or loosely monitored system.

Indeed, the real and final responsibility for meeting the proposed wastewater effluent standards effectively rests with the seafood industry and its component firms since the direct financial burden rests with the decision making firm. Legislators legislate, regulators regulate and enforcers enforce but the seafood processing firms must implement the plans and install the hardware to achieve whatever effluent discharge levels are adopted for the nation's watercourses and estuaries. The existing dilemma in coastal areas remains the question of determining the economically efficient levels of waste treatment as provided for in the latest Federal Water Pollution Control Act (FWPCA) Amendments (P.L. 92-500).

#### Basic Provisions of P.L. 92-500

P.L. 92-500, FWPCA Amendments (1972), re-

quires the Environmental Protection Agency (EPA) to prepare and publish regulations and standards for effluent discharges. The resulting effluent guidelines suggest "no discharge" of process waste waters to navigable waterways by 1977, and the requirement for permits for all point source discharges. Municipal plants must provide "secondary treatment" by 1977 and industries must comply with the "best practicable control technology" currently available.

By 1985 a no-discharge (of pollutants) standard must be met. If industrial plants discharge to municipal systems then EPA must prescribe pretreatment of effluent sufficient to prevent interference with or pass through of the municipal system. Industrial plants discharging to municipal systems must also pay a proportionate share of construction and operating costs as user charges, if the municipality is the recipient of Federal funds for its water and sewer system. In addition, if an industry discharges to a municipal system, that municipal system must meet the industry effluent standards prescribed for that industry.

Stricter effluent standards may also apply if necessary to meet ambient water quality standards on the basis of use, e.g., fish propagation, or recreation, or if required by State-designed guidelines. By 1983 municipalities must achieve "best practicable" levels and industries must achieve "best available" levels unless economic and social costs exceed benefits. The Georgia proposal of 30 ppm BOD for shrimp processing effluent standards would presumably result in a BOD removal requirement of 99 percent. It is doubtful that such high levels of seafood waste treatment would be economically feasible regardless of whether the institutional arrangement was public (municipal treatment) or private. The critical point I wish to make is that we are faced with a changing demand situation for water quality which directly affects the economics of the seafood industry, especially processing where wastes are concentrated. We have sought institutional answers in the public sector by a complex series of legislated effluent standards and grants from Federal funds which have not encouraged the development of solutions based on economic efficiency. The results are obviously beginning to be very costly directly in misallocated resources and increasing social costs. I would suggest that efforts be made by the leadership in the industry and public offices to work out an economically efficient system of seafood waste disposal which considers fully the real, rather than the emotional, demands for water

quality, the best institutional arrangements to meet such demands, and the apportionment of costs among the consumers of water quality.

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#### SELECTED BIBLIOGRAPHY

Ronald Coase, "The Problem of Social Costs," Journal of Law and Economics, 3:1-44. October 1960.

Harold Demsetz, "The Exchange and Enforcement of Property Rights," Journal of Law and Economics, 7:11-26. October 1964.

Robert K. Davis, The Range of Choice in Water Management—A Study of Dissolved Oxygen in the Potomac Estuary, The Johns Hopkins Press, Baltimore, 1968.

Orris C. Herfindahl and Allen V. Kneese, Economic Theory of Natural Resources, Charles E. Merrill Publishing Company, Columbus, Ohio, 1974. For additional detail on the Delaware Estuary Study see excerpts in Allen V. Kneese and Blair T.

Bower, Managing Water Quality: Economics, Technology, Institutions, The Johns Hopkins Press, Baltimore, 1968, pp. 25, 225-234, 274-292. Also see the original study published by the Federal Water Pollution Control Administration, Delaware Estuary Comprehensive Study: Preliminary Report and Findings, Philadelphia, 1966.

Ronald M. North and Fred M. Lyda, "Financial Implications of Waste Management Systems for Shellfish Wastes," The Southern Journal of Agricultural Economics, 7:2: December 1975.

Ronald M. North, "Economic Implications of Coastal Waste Disposal Alternatives," Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, Water Resources Research Institute, North Carolina State University, Raleigh, 1975.

U. S. House of Representatives, Committee on Public Works, Laws of the United States Relating to Water Pollution Control and Environmental Quality, Committee Print No. 93-1. March 1973.

# SHRIMP SUPPLIES IN THE SOUTHEAST AND THEIR EFFECT ON PROCESSING FIRM SIZE<sup>1</sup>

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A growing deficit in shrimp landings relative to processing needs in the Southeastern States has been of concern the past few years. Changes in the supply of raw shrimp will necessarily cause economic adjustments in the shrimp processing industry. This presentation will center around two main points: (1) the growing domestic shrimp supply deficit in the Southeastern coastal States from Texas to North Carolina and (2) what changes in the economic structure of the industry this deficit has caused and is likely to cause in future years. Within the framework of these two topics, additional comments will be made on productivity, market concentration, pricing trends, and product distribution in the Florida shrimp processing industry.

Seafood processing is an important source of income and employment in the Southeast. The wholesale value of seafood products in this region was \$642 million in 1973 representing 23 percent of the value of all seafood processed in the U.S. During this same year 1,235 seafood wholesaling and processing firms employed 18,900 employees on an annual basis and about 25,700 during the peak season. Among the eight States in the region, Louisiana, Florida, and Texas processed seafood valued at wholesale levels of \$160, \$158, and \$129 million, respectively. The remaining States of Mississippi, Georgia, Alabama, North Carolina and South Carolina had processing values of \$67, \$49, \$43, \$21 and \$16 million respectively.

Shrimp products accounted for \$389 million, representing 61 percent of all seafood processed in the Southeast and 76 percent of all shrimp processed in the U.S. in 1973. Shrimp landings in the Southeast the past few years have averaged between 65 to 75 percent of all U.S. shrimp landings; yet, the region has been deficit in supplying its own raw shrimp for processing. For example, the last few years shrimp processors have

utilized approximately 35 percent more shrimp (heads-on weight) than is actually landed in the region. Dependence on raw shrimp from outside the region for processing has increased annually since 1960 when the volume of landings approximately equaled the volume used in processed products.

Shrimp processing industries for some individual States have supply problems of much greater magnitude than the region. Only two States, North and South Carolina—both with small processing industries, land more shrimp than used in processing in the State. Louisiana, Texas, Alabama, Mississippi, Florida, and Georgia landings in 1970 represented 97, 84, 76, 57, 35, and 28 percent respectively, of all raw shrimp processed in the respective states. These percentages were about the same in 1973 with the exception of Louisiana (73%), Alabama (52%), and Mississippi (29%). This was due primarily to landings declines resulting from the late opening of the spring shrimp season in Louisiana after subnormal water temperatures and high freshwater levels affected the amount of shrimp available for harvest. Florida processed about 47 million pounds of shrimp (heads-on) in 1960. Pounds processed reached a high in 1970 of 90 million pounds with 1971, 1972, and 1973 levels of 86, 80, and 75 million pounds respectively. The major thrust in processing has been breaded shrimp which accounts for 66 percent of all Florida processing. At the same time the processing industry has been growing, shrimp landings in Florida have declined significantly. Annual landings of about 50 million pounds in 1960 have fallen to current levels of 25 to 30 million pounds.

The raw shrimp supply deficit comes primarily from a change in landings patterns and structural changes within the industry. Examination of the total Gulf shrimp industry indicates that Florida declines may now be Mexican import increases. Florida landings the last 20 years have been fairly

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<sup>1</sup>The majority of these comments are based on research by Fred Prochaska, Chris Andrew, and Jose' Alvarez of the Food and Resource Economics Department, University of Florida. The

research was also supported by the Florida Sea Grant Program. Copies of several articles and reports concerning this research will be made available by Dr. Cato, upon request.

stable except for annual fluctuations from all regions except Campeche. Landings in Florida from Campeche have dropped to around 2 to 3 million pounds annually, from earlier highs of 30 million. During the same period, imports into the U.S. from Mexico have increased from a three-year average of 35 million in 1953 to an average of 77 million in 1972—a 42 million pound increase. During this period total Florida landings fell 25 million pounds. Imports from other countries such as India have also increased substantially.

This apparent supply deficit position which shrimp processors in the Southeast are acquiring makes apparent three questions. First, what is the economic feasibility of locating additional processing plants in the Southeast? Second, what will be the economic growth potential of a processing industry dependent on raw supplies from outside the state and from imports? Third, what will be the impact on the market structure of a shrimp processing industry dependent on external supply?

The remainder of this discussion deals with the changing economic structure of the Florida shrimp processing industry and will point out considerations of utmost importance for current managerial and investment decisions by firms and for long-run planning relative to optimum firm size and product lines. Basically, we will analyze by size category the entry and exit patterns of firms in the Florida shrimp processing industry during the 1959-71 period. These patterns will then be used to anticipate the number and sizes of firms over time and lead to remarks about what this means to the Florida shrimp processing industry.

Thirty-one different firms processed shrimp from 1959 to 1971 in Florida. The number of plants in 1959 totaled 15. By 1971 there had been 16 new plants to enter the industry and 14 plants to exit, leaving a total of 17. Only 8 of the original 15 in 1959 were still operating.

By dividing these firms into 3 size categories: small (less than 30 employees), medium (31 to 300 employees), and large (greater than 301 employees), examination of entry and exit patterns indicates that the large and small firms are much more stable than the medium size firms. This is probably due to a special characteristic of the Florida shrimp processing industry. The largest firms sell a general line of products and are sufficiently large and are more economically efficient in purchasing and processing. They develop greater access to raw supply sources which are scarce and have greater knowledge of the national market accompanied by stability in supplying their customers.

Small firms are able to enter the industry with relative ease but find it difficult to grow in size. They succeed as small firms because they produce specialty products, sell in isolated markets, or develop their small processing plant based on raw supplies from their own fleet of shrimp trawlers.

Medium size firms tend to be unstable initially because they are unable to get into specialty markets and are too small to compete in the national major line shrimp markets. Since 1959, the medium size firms have been able to remain in the industry from 4 to 7 years, while the small firms average 9 years and the largest firms 13 years in operating life.

Five other components of the economic structure of Florida's shrimp processing industry also reveal some behavioral patterns. Prochaska, Andrew, and Alvarez, in a 1972 personal survey of 11 (representing 85 percent of total production) of Florida's shrimp processing firms, documented specific characteristics about concentration, pricing, margins, productivity, and marketing by firms in the industry. Florida's industry is very concentrated. The largest 8 firms represent 95 percent of production. These same 8 represented 28 percent of the U.S. industry. In 1972, foreign shrimp prices, as determined by the survey, were not significantly higher than domestic prices. Average price paid for Florida shrimp was \$1.51, while \$1.38 and \$1.56 was paid, respectively, for other U.S. shrimp and foreign shrimp. Gross processing margins decreased as firms became larger. In fact, large firms paid less for raw supplies than small firms, but also sold their product for less. Of course, pricing and production problems within the industry since 1973 could have changed the relative prices and margin behavior. Productivity was also measured and indicated that, during 1972, the industry was utilizing only 55 percent of total plant capacity. Around 60 percent of Florida processed shrimp is consumed in institutions while the remainder is sold at retail. Shrimp were sold to the Northeast, Southeast and Western regions of the U.S. in relative shares of 37, 33, and 30 percent respectively.

Where does this leave an industry with apparent raw supply problems operating at less than capacity? The historical entry-exit patterns by firms in the industry come as no surprise and indicates repeated shifts in the market structure. New entrants and existing processors must be particularly careful in making their choice of product lines, plant locations, and size of operations in the future. Increased transportation costs will be



even more important, since a substantial amount of shrimp processed is trucked in from outside the states where plants are located. More dependence on imports will also influence processing operations.

Entry into the industry for small firms will be less difficult if they have an isolated market and/or produce a specialty product. Large and small firms will be much more stable than medium size firms once they become established. Repeated entry-exit patterns similar to those from 1959 to 1971 indicates a predominance of large and small firms by 1985 and an equilibrium with regard to the total number and size distribution of plants. Statistical analysis indicates that the total number of firms in the Florida shrimp processing industry will reach an equilibrium of 19 in 1985. This compares to 15 in

1959 and 17 in 1971.

Distribution of firms by size will be substantially different than in 1959. The number of small firms will increase from 7 to 12, medium size firms will decline from 7 to 4 and the number of large firms will remain at 3 as currently in existence, up from 1 in 1959. An equilibrium number of firms appears to already be in existence in the medium and larger size categories.

These data lead to an indication of further concentration in small and large firms in the Florida shrimp processing industry. Potential investors and existing processors contemplating firm size changes must consider that medium size firms will not offer the same stability as small or large firms in making future investment decisions.

# LEGAL ASPECTS OF PUBLIC ACCESS TO BEACHES

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## INTRODUCTION

The need for special policies protecting public rights to the use of beaches has been recognized since Greco-Roman times.<sup>1</sup> From this Nation's earliest history, public recreation at the seashore has been encouraged as a matter of public policy.<sup>2</sup> The expanding demand for beach recreation, however, exacerbates the traditional conflict concerning ownership of coastal recreation lands. These rights have not been finally delineated in most of the Nation, but recent institutional actions provide a foundation for innovative legal mechanisms to ensure public access to beaches.

The scholarly literature pertaining to this subject, and even most primary legal sources, are broad in scope. I shall focus on one question: How can the Coastal Plains States expand their recreational opportunities by ensuring the public's rights of access to their beaches?

Traditionally, beaches, and access thereto, have been acquired by gift or condemnation.<sup>3</sup> But escalating demands for coastal property have resulted in gyrating prices, gifts are less frequent, and condemnation or purchase is beyond the financial capabilities of public agencies. It is necessary, therefore, to explore allocation and access devices which are less dependent on market factors.

## PHYSICAL BOUNDARIES AND JURISDICTION

"Beaches" generally refers, in the law, to areas which border the sea and are subject, or adjacent, to the ebb and flow of daily tides. For our purposes, "beach" consists of both the foreshore and the dry sand area.

Throughout most of this country, the public has property rights in the foreshore because each state

originally owned the ocean tidelands as an inherent attribute of its sovereignty.<sup>4</sup> Today, these lands are either in the state's ownership or subject to a public trust for commerce, navigation, and, in some jurisdictions, recreation.<sup>5</sup> The United States Supreme Court established that the common law rule puts the tidelands boundary at the mean high tide line.<sup>6</sup> But there are several state variations from this principle. For example, Maine, Massachusetts, and New Hampshire follow colonial ordinances in drawing their line between public and private ownership at low water or 100 rods seaward from high water, whichever is less. Virginia, Connecticut, Delaware, and Pennsylvania recognize private interests to low water. In Florida, Alabama, and California, when the law is affected by Spanish and Mexican grants, the tidelands boundary is set at mean high tide, as with the common law rule. In Texas, grants made before January 20, 1840, are good only to mean high tide; subsequent grants of littoral land by Texas follows the common law principle.<sup>7</sup> The principal compromise position is that the state owns the tidelands in trust for the public and any grant purporting to convey such land will be strictly construed.<sup>8</sup>

The exact location of the highwater mark frequently is a matter of controversy. Surveyors rely on tidal benchmarks as the base for the measurements. But when the line between benchmarks must be interpolated, inaccuracies can include hundreds of acres.

Even unchallenged recognition of the public's rights in the tidelands does not alleviate the Nation's critical beach recreation problems. With the dry sand portion of the beach and the uplands subject to private control, public enjoyment of the beaches is seriously threatened in two ways. First, private littoral owners<sup>9</sup> often restrict use of the dry-

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<sup>1</sup>See, for general historical review, "The Public Trust in Tidal Areas: A Sometime Submerged Traditional Doctrine", 79 *Yale L. Jnl.* 762, (1970) (hereinafter referred as "Submerged Doctrine").

<sup>2</sup>See, e.g., *Jackvony v. Powel*, 21 A.2d 554, 558 (1941), for discussion of an early state constitutional provision protecting the "common law rights of the people" in the shore.

<sup>3</sup>R. Powell, *The Law of Real Property*, Sec. 159, at 643 (1969) (hereinafter cited as Powell).

<sup>4</sup>1 R. Clark, *Waters and Water Rights*, Sec. 36.4(A) (1967)

<sup>5</sup>*Ibid.*, note 5, Sec. 36.4(B).

<sup>6</sup>*Borax Consol.*, *supra*, at 26.

<sup>7</sup>1 R. Clark, *supra*, note 5, Sec. 36.3(C).

<sup>8</sup>Clineburg & Krahmer, *supra* at 23.

<sup>9</sup>Littoral owners may be defined as any who hold title to lands along the seacoast.

sand area, and only on the foreshore can the public sunbathe and picnic. Second, many beaches are isolated, becoming inaccessible, de facto private beaches, by natural barriers or uplands access restrictions imposed by private owners. In this way, coastal subdivisions can virtually monopolize beaches, manifested in "Private Beach, No Trespassing" signs.<sup>10</sup>

I will, therefore, address the two issues central to public rights in the seashore: (1) what are the nature and extent of public rights in both the foreshore and dry-sand area, whether derived from state ownership or protected by public trusteeship, and (2) how can public access to beaches be ensured in light of private ownership of the uplands?

### THE COMMON LAW TRADITION

Throughout the centuries, there has developed a doctrinal core of rights pertaining to public beach access. Lawmakers, nevertheless, have redefined allegedly "immutable" rules of property law to accommodate contemporary social needs. Often courts fashion the initial institutional response to social problems only to frame political and legal theories for subsequent legislative action. To understand the inherited legal tradition, to evaluate current practices, and to recommend alternatives, a historical perspective and analysis of alternative legal doctrines are first required.

The concept of public rights in the shore was established in Greek and Roman law.<sup>11</sup> Roman jurisprudence, developed in a commercial, urbanized society, with a conspicuous heritage from the sea-dependent Greeks, held that, by "natural law", the "air, running water, the sea, and consequently the seashore" were "common to all".<sup>12</sup> Thus, the Mediterranean's shores were common to all citizens.

With the Roman Empire's decline, public ownership of tidal areas generally was usurped by feudal lords. By 1066, the absolute ownership of all English lands was vested in the Crown.

In part a reaction to the king's proliferating

private landholdings, the Magna Carta signalled a shift back in the direction of public rights in the seashore. Yet it was only grains of public interest protection which permitted the document to be a source of adaptation for the law of the foreshore.

With the commercial and industrial revolutions, unrestricted access to the foreshore and riverbanks were necessary for shipping and fishing. The courts, while not entirely abandoning the Roman conception of common ownership, spoke in terms of particular guaranteed public rights.

The idea that the foreshore had been omitted from the scope of royal coastal grants was first advanced in the 1560's and was judicially accepted in 1632.<sup>13</sup> This retained royal title, the jus privatum or king's personal right, originally encompassed complete ownership of the foreshore. But political pressure forced the Crown to stipulate that its title was held for public purposes, thereby transforming the jus privatum into the jus publicum, or public right.<sup>14</sup>

The Crown's interest evolved to be perceived as the people's. This theory was ratified, in response to economic and political pressures, during the Elizabethan era.

This seeming re-emergence of the Roman common rights concept as applied at least to tidelands was a significant influence on property law in the United States. Since the King's title to lands discovered in America was limited by seventeenth century English common law, the foreshore was thought to be not his private property, but as land in trust for the protection of public uses.<sup>15</sup>

With the American Revolution, this proprietorship of both the personal and representative portions of the royal title passed from Parliament to the citizens of each state. Each American state originally held complete legal and equitable title in the foreshore as a representative right. Portions of that complete ownership for which public purposes were deemed unnecessary were transferred to the jus privatum as freely alienable state rights.

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<sup>10</sup>See, Wiel, "Natural Communism: Air, Water, Oil, Sea, and Seashore", 47 Harv. L. Rev. 425, 452 (1934).

<sup>11</sup>Sax, "The Public Trust in Natural Resources Law: Effective Judicial Intervention", 68 Mich. L. Rev. 473, 475 (1970) (hereinafter referred to as Sax).

<sup>12</sup>Ibid., at 2.1.1-2.1.6.

<sup>13</sup>Attorney General v. Philpott, 8 Chan. 1 (1932), discussed in "Loyola Tidelands Trust", supra at 490.

<sup>14</sup>"Public Access to Beaches: Common Law Doctrines and Constitutional Challenges", 48 N.Y.U. L. Rev. 369 (1973) (hereinafter cited as "Common Law Doctrines").

<sup>15</sup>See, e.g., Martin v. Waddell's Lessee, 41 U.S. (6 Pet.) 367, 412-13 (1842); Shively v. Bowlby, 152 U.S. 1, 57 (1893).

The principle of public interest in the tidelands was derived, however, from the substantial demand for access to the sea for fishing and commerce. Although the Common Law defines public right in terms of precedents based upon past uses and demands, the principle itself requires adaptation in accordance with changing views of the general welfare. Upon this basis, alternative common law theories can be employed to litigate public beach rights.

The Public Trust Doctrine. A more generalized version of the jus publicum,<sup>16</sup> the public trust principle holds that some property rights in certain lands can never be alienated from the general public. The doctrine is supported by several rationales with a common theme: property rights in certain natural resources essential to society must be vested in the general public.<sup>17</sup>

Citizens and their lawmakers are themselves subject to the trust restrictions. Thus, the states, and their courts, are individually responsible for defining the extent of public rights in trust properties, such as the tidelands. And the state, as trustee, can act only to improve the public right.<sup>18</sup>

The public trust literature identifies the protected interests as those which were socially or politically important at the time legal protection was extended to public uses. Although particular interests, such as fishing and navigation, have been specifically defined in trust terms, the doctrine has been applied in a quasi-cost/benefit manner. In fact, there is a significant correlation between (1) the supply and demand of recreational beaches, and (2) the legal rights of public access.<sup>19</sup>

Why, then, in view of the unprecedented demand for coastal recreation, does the public trust doctrine not provide a sufficient mechanism for ensuring public access to beaches?

The answer is part historical, economic, and political.<sup>20</sup> Before the reversion to the concept of sovereign trust in the thirteenth century, the Crown

had already granted private titles to much of England's coastal lands. Anglo-American property law, never fully embracing the Roman common ownership concept, therefore cast the public interest in the foreshore as a dominant public easement. The economic forces of the private real estate market, reacting to intensified competition for coastal recreation sites, have ignored public recreation needs. Furthermore, coastal municipalities often subordinate regional or general public interests to local planning and political pressures.

With the emergence of environmental law, the public trust has been employed in the protection of public parks.<sup>21</sup> Three clear limitations have been placed on the authority of government as trustee: (1) the property cannot be sold; (2) the property must be maintained for particular types of public uses impressed with the trust; and (3) the property must be available for general public use.<sup>22</sup> The minimum limitation on the state's power of regulation should, therefore, be that it must keep its trust lands available to the general public.<sup>23</sup>

Until recently, purely environmental and recreational considerations have never been embraced by the public trust doctrine because the scope of the police power, delineating the "general welfare", was not adequate to do so.<sup>24</sup> The potential scope of permissible uses under the public trust doctrine is therefore limited solely by the scope of contemporary perceptions of the general welfare.

Custom. Other traditional common law concepts have been recently employed by state courts to respond to the erosion of public recreational opportunities in the Nation's shoreline. Several approaches have significant potential for preserving existing beach uses and designating new public accessways.<sup>25</sup>

"Custom" is based on the belief that century-old uses must be founded on legal rights conferred in the past and should be recognized even though never formally recorded. To be enforced; the custom

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<sup>16</sup>"Common Law Doctrines", *supra* at 385.

<sup>17</sup>See Sax, *supra* note 114, at 484-5.

<sup>18</sup>*Id.* at 452.

<sup>19</sup>See "Submerged Doctrine", *supra*.

<sup>20</sup>See Ducsik, *Shoreline for the Public*, Ch. 4 (1974).

<sup>21</sup>See *Citizens to Preserve Overton Park v. Volpe*, 401 U.S. 402 (1971).

<sup>22</sup>See Sax.

<sup>23</sup>*Ibid.*, note 114, at 477.

<sup>24</sup>See, e.g., *East New York Sav. Bank v. Hahn*, 326 U.S. 230 (1945).

<sup>25</sup>Adverse possession has little relevance to beach access because the public rarely is in continuous, actual possession of beach lands.

had to have existed so long that "the memory of man runneth not to the contrary".<sup>26</sup> To be enforceable, the custom must be (1) "ancient", (2) reasonable and peaceable, (3) exercised without interruption, (4) of certain boundaries, and (5) obligatory and not inconsistent with other customs or laws.<sup>27</sup> Long ignored in this country, a recent beach access case breathed life into this doctrine.<sup>28</sup>

The Court asserted that a public use is sufficiently immemorial if it can be traced to the beginning of an area's political history.<sup>29</sup> But the decision's scope may be read in different ways: either as a binding declaration of the rights of all littoral owners, or as applying only to the litigated beach area. If read broadly, consequently, the holding may violate fundamental due process principles because it declares *ex parte* a new public right absent supporting evidence and without giving interested property owners a chance to be heard.<sup>30</sup>

The narrow interpretation, free of these constitutional and evidentiary difficulties, allows that the doctrine applies to individual beaches only if the state can prove long public beach usage in addition to the other elements of a valid custom. Complex litigation is a practical prerequisite, therefore, to the opening of many beaches to the public, under this theory.

Custom, applied with the narrow, more tenable interpretation, essentially permits the state to claim an easement by public use on particular accessways. It cannot, by single claim, serve as the basis for declaring that an entire state's beaches belong to the public. It promises most help when littoral owners have been unaware of their title in the beaches and the state can demonstrate long public enjoyment of the site.

**Prescription.** Prescription has supplanted custom

to be the principal legal theory governing the creation of public easements in privately-owned lands. When the public acquires such an easement, title to the land remains in the owner, but use of the land for recreational purposes must now be shared with the public. Under this doctrine, such an easement can be created through open, continuous, and adverse use of the land without the owner's permission.<sup>31</sup>

Prescriptive rights are acquired only by actual, continuous, uninterrupted use by the claimant of the lands of another, for a prescribed period.<sup>32</sup>

There are several problems in applying prescription to meet the demand for beach access. It is questionable whether the common law recognizes prescription by the public, apart from the exception of public highways, as distinguished from the prescription of private easements. Secondly, a recreation easement, precluding other interfering uses of the land, could unfairly fix the land's uses forever. Finally, the declaration of public prescription in certain beaches could result in the closing of other privately-owned beaches to the public.<sup>33</sup>

**Dedication.** Dedication, like prescription, refers to rights in particular land parcels, but relates only to public uses.<sup>34</sup> To be enforceable, the theory depends on both the owner's intention to offer specific land or interests therein and acceptance by the public, and both can be either expressed or implied. Its most common context is roadway easements, but dedication of recreation lands has been implied when owners made appropriate references on recorded subdivision maps or advertisements.

To establish common law implied dedication, no formalities are necessary; conduct showing an intent by the owner to dedicate land and an acceptance by the public completes the dedication.

<sup>26</sup>This phrase was understood to refer to a usage begun before the coronation of Richard I in 1189. See "Constitutional Challenges", *supra* at 375 *et seq.*

<sup>27</sup>The requisite elements are found in 1 W. Blackstone, *Commentaries* 76-78. See "Public Access to Beaches", 22 *Stanford L. Rev.* 564, 581-84 (1970) (hereinafter cited as "Beach Access"); "Constitution Challenges", *supra* at 375-77; "Californians Need Beaches—Maybe Yours!" 7 *San Diego L. Rev.* 605, 618-20 (1970) (hereinafter cited as "California Beaches"); and Ducsik, *supra* at 110-12.

<sup>28</sup>The doctrine had been applied in a few New Hampshire cases. See, e.g., *Knowles v. Dow*, 22 N.H. 387 (1851); *Nudd v. Hobbs*, 17 N.H. 524 (1845). Courts in other states had rejected the theory on the basis of the arguments that no American custom could be old enough to be "immemorial"; See, e.g., *Delaplane v. Crenshaw*, 56 Va. (15 Gratt.) 457, 470-75 (1860), and that

recording systems have been in use since the formation of this country; see, e.g., *Gillies v. Orienta Beach Club*, 159 Misc. 675, 681, 289 N.Y.S. 733, 739-40 (Sup. Ct. 1935).

<sup>29</sup>*Thornton*, *supra* at 597-98, 462 p. 2d 671, 677-78.

<sup>30</sup>See, e.g., *Mullane v. Central Hanover Bank & Trust Co.*, 339 U.S. 306, 313 (1950).

<sup>31</sup>2 American Law of Property, Sec. 8.4 *et seq.* (A.S. Casner ed. 1952); see Degnan, "Public Rights in Ocean Beaches: A Theory of Prescription", 24 *Syracuse L. Rev.* 935, (1973) (hereinafter cited as "Prescription Theory").

<sup>32</sup>Usually fixed by statute.

<sup>33</sup>"Prescription Theory", *supra* at 936-937.

<sup>34</sup>See McQuillan, 11 *The Law of Municipal Corporations* (3rd ed. rev.) Sec. 302, pp. 627-630.

Both intent to dedicate and acceptance may be implied from public use. An owner's inaction may be taken as evidence of acquiescence in public use and thus of his intent to donate the land. The public use itself may be taken as evidence of acceptance. Once the implicit offer has been accepted, the owner cannot revoke his dedication. The public cannot lose its rights through non-use or adverse possession. The public normally takes only an easement by implied dedication, with the owner retaining the underlying fee; a few courts, however, have found dedication of a fee simple title in circumstances indicating an intent to give such a title.<sup>35</sup>

Until the 1960's, the courts, refusing to find these requisites in beach access cases, held that long unobstructed public use of beaches, like forests and prairies, was presumed to be under a revocable license from the owner.<sup>36</sup> Dedication, therefore, is an important theory in cases concerning public beach land since rights in public land may not typically be acquired by prescriptive use.<sup>37</sup>

### BEACH ACQUISITION

Given the documented fact that the private market has not provided adequate public access to the Coastal Plains Region's beaches, there is need for collective, allocative decision-making by private interests and government. Public agencies, at the local, state, regional, and Federal levels, can induce, compel, or otherwise influence land use determinations which can expand the area's coastal recreation opportunities. Their ecological vulnerability notwithstanding, public beaches have been dealt with as parks, and the applicable law, therefore, is that which has been formulated in open space and recreation planning. Principally through acquisition and exercise of the police power, public agencies have allocated coastal resources

Acquisition, the securing by a public agency, for compensation, of the fee simple interest,<sup>38</sup> or an easement through purchase or condemnation, is the most direct approach to the expansion of public beach facilities. There is no question that the Federal Government, the states, and authorized municipalities can constitutionally purchase or condemn land for recreational purposes.<sup>39</sup> Courts have long held that parks and other recreational facilities are legitimate objectives of public land use.<sup>40</sup>

Direct Federal acquisition has resulted in coastal National Parks<sup>41</sup> and National Seashores.<sup>42</sup> The basic feature of National Seashore legislation is the Federal Government's acquisition of large tracts of beach and open land which thereafter are kept open, subject to minimum development to accommodate tourists.<sup>43</sup>

Objections to the National Seashore approach are several. The most obvious is expense. Even the Federal Government cannot afford to purchase large areas of semi-developed and commercially valuable shoreline.

Economic tension is inevitable under this mechanism. Open space preservation and expanded public beaches make the entire area more attractive, but the construction generated by increased tourism is forced into a greatly reduced land area. The increased need for municipal services results in higher taxes on unrestricted land, and resident homeowners bear these hardships.

Two conflicting voices in opposition would come from the private sector. Those coastal residents and developers who have enjoyed the economic benefits of the demand for beach recreation opportunities would oppose any action which might undermine potential construction. Others would oppose the flood of tourists, perhaps greater to a National

<sup>35</sup>*Ibid.*, at 537.

<sup>36</sup>*See, e.g., City of Manhattan Beach v. Cortelyou*, 10 Col. 2d 653, 76 P.2 483 (1938); *F.A.Hihn Co. v. City of Santa Cruz*, 170 Col. 436, 150 P. 20 62 (1915).

<sup>37</sup>*See, also, State Highway Commission v. Bauman*, 3 ELR Sec. 20290 (Ore. Cir. Ct., Feb. 23, 1977).

<sup>38</sup>*I.e.*, the entire "bundle of rights" associated with the property.

<sup>39</sup>*See* cases cited in Williams, *Land Acquisition for Outdoor Recreation—Analysis of Selected Legal Problems*, Outdoor Recreation Resources Review Commission Study Report No. 16, at 2-7 (1963). This discussion of acquisition relies heavily upon Ducsik, *supra*, at 137-52; *Massachusetts Report*, *supra* at 95-115; and cases cited therein.

<sup>40</sup>*See, e.g., Yosemite Park & Curry Co. v. Collins*, 20 F. Supp. Cal. (1937).

<sup>41</sup>*E.g.*, Acadia, Maine (acquired in 1919); Olympic, Washington (1938); and the Virgin Islands (1956).

<sup>42</sup>*See* 16 U.S.C. Sec. 4596-99 (1970). *E.g.*, Cape Hatteras National Seashore; Cape Cod, Point Reyes; Fire Island; Assateague Island; Gulf Islands (Florida-Mississippi); Cumberland Island; and Cape Lookout. The House Appropriations Committee approved funds for land acquisition that would constitute the Cape Canaveral National Seashore. *Orlando Sentinel-Star*, (July 19, 1975).

<sup>43</sup>*See, e.g.*, 16 U.S.C.A. Sec. 459b (1961) (Cape Cod).

Seashore than to private and municipal beaches, that would tax the service capacities of the local communities.

Another Federal acquisition program is within the jurisdiction of the Bureau of Sport Fisheries and Wildlife, Department of Interior. Although some recreational facilities are occasionally included on these lands, they generally do not contribute to the available supply of public beaches. Also, Interior, under the Surplus Property Program, is authorized to turn over surplus Federal real estate to localities for recreational purposes at minimal or no cost.<sup>44</sup>

To avoid price escalations in the typically long delay between enactment of a park activity and its execution, authorization and acquisition should be simultaneous by use of a legislative taking. Perhaps a drastic procedure to some, the legislative taking is best suited for halting speculation and further, accelerated development. This can be avoided by the government's taking title to all land upon authorization, payment bearing interest to follow.<sup>45</sup>

Congress has also provided for grants to states, counties, and cities for the acquisition of recreational lands.<sup>46</sup> The most important of these are the Land and Water Conservation Fund, managed by the Bureau of Outdoor Recreation,<sup>47</sup> and the Open Space Land Program, administered by the Department of Housing and Urban Development.<sup>48</sup>

The Fund is financed through revenues from user fees at Federal outdoor recreational areas, sale of surplus Federal property, the Federal motorboat fuel tax, and off-shore oil and gas leases. These funds can be supplemented by Congressional appropriations. To qualify for grants, a state must have formulated a comprehensive outdoor recreation plan and the project must be consistent with the plan.

The Open Space Program, serving both recreation and other purposes, authorizes matching grants of up to fifty percent to states and local

governments for the acquisition and limited development of, among other things, parks. Projects must be urban in character, and priority is given to those which are especially accessible to minority low-income and moderate-income citizens.<sup>49</sup>

States have, in recent years, initiated noteworthy large-scale open space programs, including acquisition and grants-in-aid to local government.<sup>50</sup> South Carolina's Heritage Trust Program is a major effort to this end.

Some states have authorized municipal conservation commissions.<sup>51</sup> These designate, request, and spend the municipal government's funds, in coordination with the state and Federal agencies, for resource planning and acquisition of open space and recreation lands, including beaches.

Acquisitions by gift, devise, or other means, are approaches in addition to outright purchase or eminent domain taking. Several National organizations, such as The Nature Conservancy and The Trust for Public Land, acquire properties for conservation purposes, and this concept may be extended to recreational objectives. The fashioning of tax incentives for the grant of recreational easements would also likely induce gifts. Otherwise, in light of limited public funds for fee simple acquisition, local governments might acquire long-term public use rights through negotiated leases, conservation restrictions, or other less-than-fee arrangements.

## CONSERVATION REGULATIONS AND EASEMENTS

Conservation restrictions may be created by a will, deed, or other written instrument and may be stated in the form of a restriction, easement, covenant, or condition.<sup>52</sup> The grantor of such a restriction to any qualified governmental agency or charitable organization may receive Federal tax

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<sup>44</sup>40 U.S.C. Sec. 484(e), (j), and (k).

<sup>45</sup>The Conservation Foundation, National Parks for the Future 41-42 (1972).

<sup>46</sup>See U.S. Dept. of the Interior, Bureau of Outdoor Recreation, Federal Outdoor Recreation Programs and Recreation Related Environmental Programs (1970).

<sup>47</sup>161 U.S.C. Sec. 406 (1).

<sup>48</sup>162 42 U.S.C.A. Sec. 1500.

<sup>49</sup>24 C.F.S. Sec. 4.203(b).

<sup>50</sup>E.g., New Jersey's Green Acres Land Acquisition (1961), Oregon's authorization of Highway Department purchase of shoreline for recreational purposes (1971), and Massachusetts' acquisition of Boston's Harbor Islands (1970). See Whyte, The Last Landscape at 62-63 (1968), and Eveleth, "An Appraisal of Techniques to Preserve Open Space", 9 Villanova L. Rev. 559 (1964).

<sup>51</sup>See Ellis, "Massachusetts Open Space Law", Open Space and Recreation Program for Metropolitan Boston (1969), at 15, 91-93.

<sup>52</sup>*Ibid.*, sec. 31.

benefits and be eligible for a reduction in the assessed value of the restricted property.<sup>53</sup>

In effect, conservation or recreation restrictions are contractual easements, restricting development of privately-held property by transferring "development rights". Reservation of some private uses and natural open space preservation objectives limit this concept's applicability to beaches, but it is another means for relieving existing problems by providing scattered mini-beach sites. Moreover, the approach might be extended, by legislative action, to recreational purposes.

Easements are the more traditional less-than-fee simple approach.<sup>54</sup> This legal device provides for title to remain in private lands, but subject to positive or negative constraints, the former securing for the buyer the right to use the subject land for specified purposes, the latter limiting the uses to which the landowner may put the land.<sup>55</sup> For both, the compensation is the value of the relinquished property rights, measured by the difference in the market price of the land with and without the easement. The device can achieve public access to beaches at significantly lower costs than acquisition of the fee simple.

Purchase and condemnation easements are well suited for beach access needs. Negative easements could provide a relatively inexpensive interim device for preserving particular open spaces for future acquisition for recreational purposes. Several states and the National Open Beaches Bill have incorporated open space easements, development rights, and similar lesser interests in land for conservation purposes, and these, with or without legislation, could be extended, in varying degrees, to recreation.<sup>56</sup>

Most planners view government acquisition programs as the best means of responding to the demand for beaches.<sup>57</sup> When acquisition is not

possible in the near-term, the shoreline can be subjected to regulations with similar objectives.

## THE POLICE POWER AND THE TAKING ISSUE

To weigh the applicability of alternative land use regulations to problems of beach access, the constitutional limitations of the police power must be understood. This power is the state's authority to regulate citizens' activities in the interests of public health, safety, morals, and the general welfare.<sup>58</sup> Since the 1920's, the doctrine's application has expanded to include not only density control and preservation of property values, but also aesthetic, historic, scenic, and architectural objectives.<sup>59</sup> It is today generally accepted, therefore, that land use regulations for recreational purposes are a valid exercise of the police power.<sup>60</sup>

The pivotal constitutional reference, as the police power constrains beach access mechanisms, is the Fifth Amendment to the United States Constitution: "nor shall private property be taken for public use, without just compensation". By the Fourteenth Amendment, this prohibition has been applied to the states.<sup>61</sup>

Whenever American governments need land for some public purpose, they have either purchased the land in the private market place or exercised condemnation powers, paying the owner the fair market value of his land. Yet throughout this country's early history, no indirect or consequential damage, no matter how serious, warranted compensation. Justice Holmes altered this tradition in *Pennsylvania Coal Company v. Mahon*.<sup>62</sup> While property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking.<sup>63</sup> Since that decision, the courts, confronted with "taking" allegations, have employed a balancing test: weighing the regulation's public benefits

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<sup>53</sup>See Metropolitan Area Planning Council, Massachusetts Open Space Law, Supp. at 22 (1972).

<sup>54</sup>See Note, "Techniques for Preserving Open Spaces", 75 *Harv. L. Rev.* 1622 (1962); Comment, "Easements to Preserve Open Space Land", 1 *Ecology L. Q.* 728 (1972) (hereinafter cited as "Open Space Easements").

<sup>55</sup>For discussion of negative easements, see Whyte, *Securing Open Space for Urban America: Conservation Easements*, Urban Land Institute Technical Bulletin No. 36 (Dec. 1959).

<sup>56</sup>See Ducsik, *supra* at 147-50.

<sup>57</sup>See *ibid.* at 145; see also Reis, "Policy and Planning for Recreational Use of Island Waters", 40 *Temple L. Q.* 155, 182-83 (1967).

<sup>58</sup>For discussion of the police power and its constitutional limits in land use cases, see generally Bosselman, *The Taking Issue* (1973) (hereinafter cited as Bosselman); see also Ducsik, *supra* at 152-71.

<sup>59</sup>See Broesche, "Land Use Regulation for the Protection of Public Parks and Recreation Areas", 45 *Texas L. Rev.* (1966) (hereinafter cited as Broesche).

<sup>60</sup>Broesche, *supra* at 110; "Preserving Open Spaces", *supra* at 1623.

<sup>61</sup>*Chicago B&Q Rr. v. Chicago*, 166 U.S. 226, 235-41 (1897).

<sup>62</sup>260 U.S. at 415.

<sup>63</sup>*Ibid.*, 415.



against the loss of property values.<sup>64</sup>

The distinction between two different types of private economic loss resulting from government activity has been asserted as the basis for a test of land use regulations' validity: When economic loss is incurred as a result of government enhancement of its resource position in its enterprise capacity, the compensation is constitutionally required; it is that result which is to be characterized as a taking. But losses, however severe, incurred as a consequence of government acting in its arbitral capacity are to be viewed as a non-compensable exercise of the police power.<sup>65</sup> Acquisition of beaches and public accessways do not neatly fit either of these classifications. Nonetheless, regulations with these objectives are "less likely subject to constitutional attack if they simultaneously permit private landowners some economic uses for their lands and yet considerably restrict uses in order to achieve public objectives"<sup>66</sup>

Strong deference is generally made in favor of the legislative power to make flexible use of the police power in response to changing economic and social conditions.<sup>67</sup> With mounting pressures for additional beach recreation opportunities, certain land use regulations may, as partial solutions, be reviewed as proper exercises of the police power and within due process bounds.

## LAND USE CONTROLS

Certain regulatory tools in the law of land use may be applied to coastal recreation in such a way as to increase public access. Each requires a trade-off between public and private rights so attention must be focused on the factual situations of illustrative cases.

Exclusive Use Zoning. Special zoning districts may be created to allow for only recreational and

open-space uses. Such regulations, when imposed near urban centers, have been declared invalid if they deprive the private shore owner of any beneficial use. Diminution of the land's value is the deciding factor.<sup>68</sup>

Flood Plain Zoning. Although the primary purpose of flood plain districts is protection of the public from flood hazards, outdoor recreation objectives may be included in their regulations.<sup>69</sup> Permitted flood plain uses may include parks, playgrounds, and marinas; and recreational access modes may be explicitly included in the enabling ordinance.

The ordinance, nevertheless, must be supported by valid public welfare conditions.<sup>70</sup> If beach recreation can be tied to more established general welfare provisions, flood plain zoning can regulate shoreline development in ways which can expand public access.

Building Setbacks and Official Mapping. Another narrow approach, effectively designating recreation as one of several permissible land uses, is the setting of building setback lines, which has been recognized as a valid exercise of the police power.<sup>71</sup> Setbacks meet all the traditional zoning objectives and may result in the expansion of beach area.<sup>72</sup>

Subdivision Exactions.<sup>73</sup> It is common for municipalities to require that developers obtain local planning board approval prior to subdivision of property. Similarly, the local government can require, as a condition of plat approval, that the landowner dedicate to public use roads, sewers, or land for parks or schools.<sup>74</sup> Developers may thereby be forced to bear part of the cost of providing streets, parks, and schools for new residents; but when the need cannot be attributed principally to the subdivision, the city generally bears the cost. It has been suggested that similar requirements regarding the dedication of public easements for

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<sup>64</sup>See Bosselman, *supra*.

<sup>65</sup>Sax, "Taking and the Police Power", 74 *Yale L.J.* 36, at 62-65. Professor Sax disavowed this view in part in "Takings, Private Property, and Public Rights", 81 *Yale L.J.* 149 (1971).

<sup>66</sup>Kusler, "Open Space Zoning", 57 *Minn. L. Rev.* 1, 65 (1971).

<sup>67</sup>See Johnson, "Constitutional Law and Community Planning", 20 *Law & Contemporary Problems* 199 (1955).

<sup>68</sup>See Ducsik, pp. 172-85.

<sup>69</sup>See Dunham, "Flood Control via the Police Power", 107 *U. Pa. L. Rev.* 1098 (1959).

<sup>70</sup>See, e.g., *Dooley v. Town Plan and Zone Commission of Fairfield*, 151 Conn. 304, 197A2d 770 (1964), and *Morris County*

*Land Improvement Co. v. Parsippany-Troy Hills Township*, 40 N.J. 539, 193A.2d 232 (1963).

<sup>71</sup>*Gorieb v. Fox*, 274 U.S. 603 (1927).

<sup>72</sup>See Note, "Zoning: Setback Line: A Reappraisal", 10 *William and Mary L. Rev.* 739 (1969).

<sup>73</sup>For discussions of subdivision control, see Heyman and Gilholl, "The Constitutionality of Imposing Increased Community Costs on New Suburban Residents Through Subdivision Exactions", 72 *Yale L.J.* 1119 (1964); Strine, "The Use of Conditions in Land-use Control", 67 *Dick. L. Rev.* 109 (1962); and Note, "Techniques for Preserving Open Spaces", 75 *Harv. L. Rev.* 1622 (1962) (hereinafter cited as "Preserving Open Spaces").

<sup>74</sup>See *ibid.*, at 188-93, and cases cited therein.

shore access be applied to coastal planned unit developers.<sup>75</sup>

This method of securing additional access to beaches is inexpensive. It can address the problem before immediate development intensifies, and does not require prior public use of the area. But it applies only prospectively, so that access patterns depend on private development activity rather than on a comprehensive statewide access plan. Moreover, its application in other than prospective situations would have little constitutional support.

Compensable Regulations. Compensable regulations, which have been applied in other open space contexts, consist of the regulations of particular lands and the provision of compensation to the landowners for losses suffered.<sup>76</sup> Under the most widely accepted version of this approach, a parcel's full market value prior to the imposition of regulations is guaranteed to the landowner if the regulation is found to be an invalid taking; to the extent that the restrictions impair the value of the land for present uses, compensation is immediately due; and to the extent that the property's potential development value is reduced, the owner is awarded damages at the time of the sale.<sup>77</sup>

What are the advantages of this method compared to acquisition of the fee simple or other interests, such as easements? In the first place, funds need not be expended unless and until a court finds that the regulation would constitute a taking in the absence of compensation. And when expenditures are necessary, the initial cost is relatively low since landowners do not recoup lost development value until the property is actually sold; and subsequent increases in the value of the land do not affect the ultimate cost to government, which is based on the value prior to regulation.<sup>78</sup> Further, this system is a means of constitutionally validating land use regulations which would, in the absence of some compensation to the property owner, constitute a taking. Essentially, they are a hybrid of regulations under the police power and a

taking under eminent domain.

This technique has not yet been tested in the context of shoreline recreation. Although their potential application merits consideration, compensable regulations may prove to generate more administrative problems than simple acquisition of easements. Moreover, courts have been very wary of regulations which can be construed to be designed to depress land values to lower possible future condemnation costs.<sup>79</sup>

## CONCLUSIONS

To varying degrees, each of the aforementioned land use regulations might be employed to expand the Coastal Plains Region's shoreline recreational opportunities. Their application may result in substantial diminution of coastal property values, but the most authoritative study of the taking issue concludes that the popular belief that land value cannot be severely reduced through regulations is unjustified by judicial decisions.<sup>80</sup> Even when regulations may constitute a taking, compensation may serve to accomplish the objectives without extensive litigation. Careful draftsmanship, articulated police power objectives, varied permitted uses, potential for reasonable private economic return, and detailed technical evidence are essential criteria for this method.<sup>81</sup>

## REGULATORY AGENCIES

Access to the beaches is frequently determined by residential and commercial construction along the coast. Although adequate public access to beaches appears not to be a criteria for their approval, review of their procedures suggest impact points for advocates of increased public access.<sup>82</sup>

The regulatory impact of most state agencies is limited to the coastal marshes. A number of these bodies have limited jurisdictional influence on land use above the mean high tide line, but none have comprehensive controls. Like the South Carolina

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<sup>75</sup>"Beach Access", *supra* at 568-69.

<sup>76</sup>See Krasnowiecki and Paul, "The Preservation of Open Space in Metropolitan Areas", 110 *U. Pa. L. Rev.* 179 (1961); and Krasnowiecki and Strong, "Compensable Regulations for Open Spaces", 24 *J. of the Amer. Inst. of Planning* 87 (1963).

<sup>77</sup>Tentative Draft #3, *Amer. Law Inst. Model Land Dev't. Code*, sec. 9-111(3).

<sup>78</sup>Ducsik, *supra* at 191.

<sup>79</sup>See "Preserving Open Spaces", *supra* at 1622 (1962).

<sup>80</sup>Bosselman *et al.*, *The Taking Issue* (1953) at 328.

<sup>81</sup>See *id.* at 294 *et seq.*

<sup>82</sup>This section is a condensation of two studies and related public information materials: *South Carolina Tidelands Report*, S.C. Water Resources Commission, (July, 1970), and "The Institutional Framework for Land Use Planning and Regulation on South Carolina's Grand Strand", Clemson University Misc. Ext. Pub. (Sept., 1974), Ch. VI.

Department of Parks, Recreation and Tourism, many state agencies control specific land areas or exercise indirect influence, but only a few departments directly affect land use throughout the coast.

The Federal Government is involved in coastal land use decisions mainly concerning coastal zone management, but also in water and sewer projects, pollution control, housing, transportation, and countless other areas. With regard to beach access the decisions of four executive departments, The Department of the Army, the Department of Interior, the Department of Commerce, and the Environmental Protection Agency, are most relevant.<sup>83</sup>

The Army Corps of Engineers has extensive real and potential power over the shoreline.<sup>84</sup> The permit process is the chief means of the Corps' involvement in all decisions regarding navigable waters and areas below the mean high tide mark. Occasionally, when the proposed activity's environmental consequences are in doubt, the Corps will require preparation of an Environmental Impact Statement.

The Corps normally requires state approval before it issues a Federal permit. When the Environmental Protection Agency or another Federal office lodges an objection, the final decision is made at the regional or National level, apart from local pressures. Occasionally, the Secretary of the Army makes the ruling.

The Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Department of Interior, regularly reviews Corps permit applications. The Bureau enjoys significant stature in coastal land use decisions. When its objections are not resolved by the applicant, Interior officials enter into arbitration efforts.

Interior's Bureau of Outdoor Recreation (BOR) is particularly interested in recreation-oriented areas. BOR determines if adequate consideration has been given to alternatives to actions, which might adversely impact rivers, parklands, and other recreational resources. Also, through its National and State comprehensive outdoor recreation plans,

BOR influences land use along the coast.

The National Oceanic and Atmospheric Administration, Department of Commerce, is involved in coastal land use decisions principally through two of its sub-agencies. The National Marine Fisheries Service reviews Corps permit applications for the activities' potential effects on marine life. The Office of Coastal Zone Management, charged with the responsibility of administering the Coastal Zone Management Act, conducts a variety of research, educational, and service activities. service activities.

Importantly, after development of a state's coastal plan, all applicants for Federal permits or Federal funding must comply with the state management program. Thus, provisions for beach access included in the plan will be recognized and enforced by the Federal permitting process.

The Environmental Protection Agency (EPA) impacts coastal land use decisions in at least two important ways. Under the Water Pollution Control Act Amendments of 1972,<sup>85</sup> EPA directs regional planning of water and sewerage development. It is also involved in the Corps permitting process. Its particular concern is protection of water quality and the marine environment, and its comments carry weight comparable to the Interior Department's.

#### NATIONAL OPEN BEACHES BILL

The bill which would have the most affect on the public access issue and which might serve as a model for state legislation is The National Open Beaches Act.<sup>86</sup> It purports to facilitate the application by state courts of any common law device which might expand public access to the beaches.<sup>87</sup> The bill was first introduced in 1969 and has never been reported out of committee, but its provisions are helpful in determining appropriate legislative mechanisms.

The Bill declares that there is a "national interest" in beaches of the United States. To protect that interest, it guarantees that: the public shall have free and unrestricted right to use (the beaches) as a

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<sup>83</sup>Among the many other federal agencies with coastal interests are the National Parks Service, the Coast Guard, the Federal Powers Commission, and the Forest Service.

<sup>84</sup>Its authority stems from Section 10 of the Rivers and Harbors Act of 1899, Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972, and Section 404 of the Federal Waters Pollution Control Act Amendments of 1972.

<sup>85</sup>P.L. 92-500.

<sup>86</sup>H.R. 10394, S.2691, 93rd Cong., 1st Sess., (1973), and subsequently re-introduced in various forms.

<sup>87</sup>See Eckhardt, "A Rational National Policy on Public Use of the Beaches", 24 Syracuse L. Rev. 967 (1973).

common to the full extent that such public right may be extended consistent with such property rights of littoral owners as may be protected absolutely by the Constitution.<sup>88</sup> When private owners hold fee simple title to littoral land, public rights of access and recreational use may still exist and can be affirmed through judicial application of traditional legal doctrines.

The Bill's activating mechanism is its authorization of the U.S. Attorney General, or a U.S. attorney, to sue in Federal court to determine beachfront property's title and control to prevent unjustifiable obstructions of public rights which may be found to exist. In addition to declaring a National policy and establishing Federal machinery regarding open beaches, this Bill specifies evidentiary rules which shift the burden of proof to the littoral proprietor to refute the presumption that the public has established recreational use rights in the uplands.<sup>89</sup>

The proposed law would not extinguish property owners' rights. Those whose titles provide the right to restrict or deny public access would not be affected. The Bill aims to encourage the clarifications of existing state laws through litigation.

No action has been taken on this Bill by the current Congress, and there is no indication of strong political interest in the measure. It provides, nonetheless, a useful model for state adaptation.

### ILLUSTRATIVE STATE APPROACHES

No coastal state has enacted innovative, effective legislation addressing public access to the beaches. General coastal zone management programs, fee simple acquisition mechanisms, and coastal regulations have been adopted, however, by a variety of jurisdictions. Several of these warrant scrutiny.

Texas, Texas, having enacted an Open Beaches

Act in 1959, was the leader in this field. The Legislature there declared the State's policy that the public has superior rights to beaches it has used regularly, and the Attorney General is authorized to litigate to protect those rights. Having won its first court test, the Act triggered a series of state measures directed at coastal zone problems.<sup>90</sup>

A legislative Beach Study Committee successfully proposed in 1969 a package of recommendations designed to preserve the beach for public recreation. State matching funds were authorized and appropriated to help local governments clean and maintain their beaches. Commercial activity on the beach itself was banned, except for licensed mobile businesses. Beach sand excavations were prohibited, and permits were required for any excavation on barrier islands. The erection of signs designed to exclude the public from the beach was declared a criminal offense.<sup>91</sup>

These measures, nevertheless, were found to be no substitute for acquisition of additional public beaches. Beach parks were developed by the State Department of Parks and Wildlife as an integral part of the comprehensive beach program, so that today almost one-fourth of the State's 400 miles of seashore has been set aside as public parks.<sup>92</sup>

California, California's coastal controls have been heralded as the "wave of the future".<sup>93</sup> With the 1972 passage of a citizen-sponsored initiative called "Proposition 20", the California Coastal Zone Conservation Act (1) established a coastal protection policy, (2) created a commission system to exercise interim development controls through an elaborate permit system, and (3) mandated a comprehensive long-term coastal management plan.<sup>94</sup> Permanent government controls were not established, and the legislature's final measures will likely depend primarily upon the experience acquired with Statewide control under the complex, interim bureaucracy, which has acted on more than

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<sup>88</sup>H.R. 10394, sec. 202.

<sup>89</sup>See Black, "Constitutionality of the Eckhardt Open Beaches Bill", 74 Colum. L. Rev. (1974), which asserts that there are no valid constitutional objections to this Bill.

<sup>90</sup>Texas Coastal Legislation, (Prepared by the General Land Office and the Texas Coastal and Marine Council; May, 1974) (hereinafter cited as Texas Coastal Legislation).

<sup>91</sup>Id., at 8-16.

<sup>92</sup>See "The Beaches—Public Rights and Private Uses", Conference sponsored by Texas Law Institute of Coastal and Marine Resources and Senate Interim Coastal Zone Committee

(1972); Footprints in the Sands of Time: An Evaluation of the Texas Seashore, Report of Texas Interim Beach Study Committee (1970); Testimony of Texas State Senator A.R. Schwartz, Committee on Merchant Marine & Fisheries, U.S. House of Representatives (1972).

<sup>93</sup>See Statutory Comment, "Coastal Controls in California: Wave of the Future?", 11 Harv. J. on Leg. 463 (1974) (hereinafter cited as "California Controls").

<sup>94</sup>Cal. Pub. Res. Code Sec. 27000-650 (West Supp. 1974). For discussion of the politics behind this legislation, see Adams, "Proposition 20—A Citizens' Campaign", 24 Syracuse L. Rev. 1019 (1973).

5,000 permits. It is the combination of temporary regulatory controls with the planning process that is the hallmark of the California approach.<sup>95</sup>

Other States. Additional state measures which merit consideration include Washington's incentive approach, limiting the liability of landowners for injuries occurring to citizens crossing their lands to the ocean and indicating that such access does not constitute grounds for adverse possession claims.

New Hampshire has addressed public access to recreational waters in two ways. Citizens may petition for construction of "a road to public waters", and such accessways are constructed if the Department of Public Works and Highways finds sufficient demand. Construction costs are borne by the Highway Department; maintenance, by the county. A statute also permits private property owners to request that their local government place discretionary easements on undeveloped land. Granted for ten-year periods, these allow the community to enjoy the benefits of public open space, while the landowner benefits from a reduced tax rate on the property. If the owner wishes to remove the easement prior to the end of the ten-year term, a tax penalty is imposed.

Other measures to be examined include: Florida's critical lands acquisition bond issue; Connecticut's coastal development moratorium; Delaware's beach preservation act; Hawaii's public access statute; Louisiana's beach maintenance program; New Jersey's seashore bathing measures; North Carolina's coastal management act; and Rhode Island's coastal resources management program.

#### RESTRICTIONS ON NON-RESIDENT ACCESS

Throughout the country, communities increasingly employ permit, user fee, and street parking policies to discourage, if not preclude, non-resident use of their beaches.<sup>96</sup> Recent court decisions provide strong authority for the position

that municipal closure of beaches to non-residents or imposition of access restrictions limiting non-resident use violates the "prior public use" doctrine unless such restrictions are legislatively authorized. Another dimension of the public trust, this principle holds that "land appropriated to one public use cannot be diverted to an inconsistent public use without plain and explicit legislation to that end".<sup>97</sup>

Constitutional arguments may also provide the broad applicability and substantive content necessary to invalidate non-resident restrictions and fees. The right of public access to shoreline recreation resources is fundamental to the Equal Protection Clause.<sup>98</sup> The constitutionality of classifications, such as residency, depends on "whether it promotes a compelling state interest".<sup>99</sup> And when essential human rights, not specifically enumerated in the first eight Amendments to the United States Constitution, are infringed upon by some governmental action, the Ninth Amendment provides a flexible instrument for protecting those rights.<sup>100</sup>

What are the legal justifications for the imposition of non-resident fees or use distinctions? First, since non-residents do not pay local taxes that provide the purchase and maintenance costs, they impose a greater financial burden on the beach community. Second, masses may likely cause deterioration of the beach. Third, there may simply not be enough automobile parking space for everyone. Finally, the towns have a right, inherent in their police power, to prevent obnoxious behavior and keep out bad influences.<sup>101</sup>

Objections to these premises are obvious: (1) beach towns enjoy great economic benefits through the tourism and recreation industry; (2) residents, as well as outsiders, cause the crowding of beaches; (3) increased fees for all users could provide for additional parking spaces; and (4) there is rarely a factual basis for the assumption that evils lurk only outside the city's boundaries.

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<sup>95</sup>The temporary permit system with simultaneous planning was successfully adopted beforehand in San Francisco with the Bay Area Conservation and Development Commission (BCDC).

<sup>96</sup>See, e.g., Darnton, "Suburbs Stiffening Beach Clubs", New York Times, July 10, 1972, at 1, col. 1.

<sup>97</sup>Higginson v. Treasurer and School House Commissioners of Boston, 212 Mass. 583, 591 (1912). The doctrine has been particularly well established in Massachusetts. See, e.g., Nickolos v. Commissioners of Middlesex County, 341 Mass. 13 (1960) (reservation); Inhabitants of Marblehead v. Com-

missioners of Essex County, 71 Mass. 451 (1851) (shoreland).

<sup>98</sup>Note, "Access to Public Municipal Beaches: The Formulation of a Comprehensive Legal Approach", 4 Suffolk Univ. L. Rev. 936 (1973). Although constitutional equal protection arguments are relevant, the general failure of courts to establish recreation as a "fundamental right" reduces this ground to one of last resort.

<sup>99</sup>Shapiro v. Thompson 394 U.S. 618, 638 (1969).

<sup>100</sup>See Justice Goldberg's opinion in Griswold v. Connecticut.

<sup>101</sup>Ibid.

User fees can therefore be imposed to offset the acquisition and maintenance costs of public beaches, but such measures cannot distinguish between residents and non-residents without a rational basis for the classification.

#### PERMISSIBLE ACCESS LIMITATIONS

If current demand levels continue to increase and if the Coastal Plains Region is to preserve its beaches' environmental attributes, some limitations on access are a virtual necessity. This may be accomplished through sound planning techniques, such as the prohibition of vehicular access from the mainland to islands and implementation of ferry transport.<sup>102</sup> But legislatively authorized restrictions which are reasonably related to the preservation of a unique resource, like beaches, and which do not totally exclude non-residents should be immune to constitutional attack.

The Department of Interior restricts both the number of visitors to, and the length of stay at, National Parks and Seashores.<sup>103</sup> Restrictions upon off-road vehicles in National Wilderness Areas have been upheld, even when imposed upon plaintiffs owning land within the area's boundaries.<sup>104</sup> Thus, the restriction must be based on an

articulated public purpose, directly related to the beach resource itself, and not be a unilateral or self-serving attempt by the state or local governments to treat non-residents on a different basis.

#### CONCLUSIONS

To the extent that the demand for additional public access to beaches in the Coastal Plains Region can be met by government acquisition and traditional exercise of the police power, no extraordinary remedies are needed. But since state and local treasuries often cannot meet the needs created by National use of the state's coast, the expansion of beach recreation opportunities will likely require the use of historic legal doctrines and innovative legal mechanisms.

These novel approaches must withstand the challenges of the constitutional prescription against uncompensated takings and traditional understandings of the police power. Parcel-by-parcel claims, however, cannot be expected to provide adequate relief to the problem. Because the public beach shortage will be aggravated by increases in population and the demand for outdoor recreation, combinations of acquisition, regulation, and common law evolution are required.

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<sup>102</sup>This method is currently being implemented at Cumberland Island National Seashore.

<sup>103</sup>See, for extended discussion, National Parks for the Future, *supra*.

<sup>104</sup>E.g., McMichael v. United States, 335 F.2d 283 (9th Cir. 1965).

# **BACK BAY NATIONAL WILDLIFE REFUGE SOME PARALLELS IN IMPLEMENTING THE COASTAL ZONE MANAGEMENT ACT**

**By DENNIS F. HOLLAND**

*Refuge Manager*

*Back Bay National Wildlife Refuge  
Virginia Beach, Virginia*

It is an honor to be asked to share with you some of the experiences of the U. S. Fish and Wildlife Service on one of its coastal refuges. Those of you representing Virginia and North Carolina no doubt have encountered some of the publicity generated by restricting vehicular access across what, we believe, is a critical area, a wild barrier beach.

I was impressed by the fact that what the Fish and Wildlife Service is trying to achieve on Back Bay with regard to beach use is almost the same as what the states must address in their planning for implementation under section 306 of P. L. 92-583. The specific areas which have to be addressed in planning under section 305, such as: (1) inventory and designation of areas of concern, (2) priority of uses, (3) determination of permissible uses and (4) the control of these uses, are almost identical to what the Fish and Wildlife Service covered in its Environmental Impact Statement when we were preparing for closure action at the Back Bay National Wildlife Refuge. But, before we get to that, let me quickly develop some background of the area and the refuge.

Tidewater Virginia's Back Bay has long been known as a "Wildfowler's Paradise". The shallow, slightly brackish bay waters and the extensive productive peripheral marshes traditionally served as the winter host for thousands of Canada and snow geese, whistling swans, coots, and ducks of all types.

During the latter part of the 19th Century, wealthy sportsmen recognized what the Tidewater people had known for over a hundred years, namely a natural cornucopia of wildlife so rich that heavy market hunting had not diminished its numbers of birds. The local people, being handicapped by the lack of roads, knew how to live off the land and waters. They not only hunted for their table, but they also guided for the rich industrialists from the more northerly states and shot birds by the thousands for the restaurant trade. Canvasback ducks were the principal target species. Some local railroad records indicate that around 1900, hundreds of "barrels" of canvasbacks were shipped

each year to the northern cities.

Naturally, hunting was mainly a winter activity, but during the spring, summer, and fall there were fish to be netted in both the Atlantic Ocean and Back Bay. The ocean yielded large quantities of fish, including croaker, trout, rockfish, and spot, for eating fresh or corning (salting). The fresher waters of Back Bay produced bass, bluegills (bream), white and yellow perch, and some mullet and rockfish.

Thus, the affluent were attracted to the abundantly productive marshes and waters of Back Bay. By the beginning of the 20th Century, practically all of the marshes were owned by wealthy hunt clubs. These owners recognized not only the value of their holdings, but also the importance of the aquatic vegetation for their sport. Records dating from the 1870's reflect the ups and downs of the aquatic vegetation. Naturally, the hunting clubs were concerned about their hunting during periods when vegetation, such as sagopondweed, redhead grass, and wild celery, was poor. The degree to which these hunting clubs would go to protect their holdings can best be shown by the fact that practically every club hired its own game wardens. In some cases, it no doubt was like getting the fox to guard the hen house, but a warden's job was to keep outsiders out of the club's hunting territory. These local wardens shot first and asked questions later. Who better would know the ways of poachers than one who had been raised living off the land?

By 1918, with the passage of the Migratory Bird Treaty Act, market hunting ceased to be legal. A way of life extending back to the Civil War days was coming to an end.

By 1938, Congress had passed two additional Acts. The Migratory Bird Conservation Act of 1929, which authorized the establishment of National Wildlife Refuges, and in 1934, the Migratory Bird Hunting Stamp Act, which authorized what is commonly known as the "Duck Stamp". The funds derived from the sale of "Duck Stamps" were earmarked for the acquisition of migratory bird refuges.

The 1930's had a tremendous impact on people

and wildlife. The Great Depression left millions unemployed. The great drought dried up the vast prairie pothole regions of the Dakotas, and the provinces of Alberta, Saskatchewan and Manitoba. This was the heart of the North American duck producing country and of great concern to the Bureau of Biological Survey, the predecessor of the U. S. Fish and Wildlife Service.

The great conservation movement was on. In 1938, Back Bay was selected as an excellent area for a National Wildlife Refuge. Two hunt clubs' properties were condemned, putting into Federal ownership 4,608 acres of beach, sand dunes, woodlands, and marsh. It is important to note that the condemnation action included land to the low water mark along the Atlantic Ocean. An additional 4,600 acres of shallow waters were closed to migratory game bird hunting by Executive Order giving Federal protection to a total of 9,208 acres.

During the early to mid '30's, the Civilian Conservation Corps (CCC) had constructed a system of sand fences along the Outer Banks of Virginia and North Carolina. As the dune system developed around the sand fencing, both Back Bay and Upper Currituck Sound would no longer have the occasional tidal overwash, a natural phenomenon which had occurred regularly since the creation of the Outer Banks. This stabilization of the dunes was to have some long ranging effects which still haven't been fully evaluated.

### MANAGEMENT

As may be gathered from the preceeding background, Back Bay Refuge was acquired as an ideal waterfowl wintering area, during a period of lowered duck populations and economic hardships.

In order to give a little better perspective, the following was written by Refuge Manager Harry A. Bailey, July 21, 1938, in the first Refuge Narrative Report:

"Following the establishment of CCC Company 3337-Camp BF-1, on April 12, 1938, near Pungo, Virginia, with a detachment of 176 men, for development work on the Refuge and adjacent property, the writer has been in close contact with Mr. Neil E. MacDougall, Camp Superintendent, in planning the future development of this area so as to utilize the potentialities to the fullest extent.

"The Bureau has given considerable time and effort in studies and observations of this area previous to acquisition of the Refuge, and it is evident the waters of this and the contiguous area are of a suitable character for the production of aquatic and marsh plants desirable as waterfowl

food.

"The Refuge area is located adjacent to and separated from the Atlantic Ocean by a comparatively narrow sand strip, and is subject to the influent of salt water during extreme tropical high sea tides. On one or two occasions during the past ten years the sea water has crossed the beach resulting in considerable destruction of aquatic life in the Back Bay waters. With this problem in mind considerable thought has been given to the most practical means of developing a defense against abnormal high sea tides.

"From observation of the previous type of sand fence construction along the beach, and the type of fence being constructed at the present, it would appear that the anchored brush is a most practical fence for building a strong sand ridge."

The CCC did complete the sand fencing for not only the 4.2 miles of refuge-owned property, but also an additional seven miles. Just to collect the sand alone accomplished very little; it was also necessary to stabilize the sand with vegetation. Native American beach grass was located and sprigged in the sand.

By 1940, using its tremendous capabilities, the CCC had cleared 60 acres of trees on Long Island, part of the Back Bay Refuge, and plowed and planted the same in corn. The Old Princess Anne (Hunting) Club House was razed and residences and headquarters buildings for the Refuge were constructed on the same site.

Other accomplishments which this conservation organization achieved were the construction of a nice patrol cabin on Ragged Island, bulkheading a short section of Long Island for wave erosion protection, and construction of wooden boats for the active management of the Refuge.

In these days, manpower and materials were inexpensive and plentiful. The foresight of our National leaders in giving the country such programs as the Civilian Conservation Corps cannot be praised too much. Many of their projects are still in use and being enjoyed today.

Initially, the Fish and Wildlife Service representative's job was to conduct biological inventories and surveys, to make the recommendations for physical development, and to implement management plans. The first inventories indicated the need to make the marshes more attractive by setting back the plant succession to produce natural vegetation which was more productive and attractive to waterfowl. The cleared 60 acres on Long Island were planted in corn in the spring, knocked down in fall and overseeded to rye for the



Canada geese. Some of the sites along the Outer Banks portion of the Refuge were also planted in a winter green browse crop for the Canada geese.

It was demonstrated that burning the marsh vegetation every 2-3 years was effective in eliminating woody bushes and in opening the dense cover for snow goose utilization of the marsh plants' rootstocks. It was also known that by regulating water levels certain types of less desirable marsh plants, such as needlerush, could be controlled.

In 1963, a system of dikes was constructed on the east side of the bay along the marsh. This diking created three main pools totaling 495 acres. The water levels in these pools could be controlled by pumping, making management almost independent of rainfall and wind tides in the bay.

### PUBLIC ACCESS

In the late '30's, there were no improved roads from Princess Anne, the County Seat, to Sandbridge, the small area at the head (north end) of Back Bay. All that existed was just a pair of ruts, which commercial haul seine fishermen used to transport their catch from the ocean beach to the railroad station at Princess Anne. The Refuge was to be located six miles south of the end of the ruts!

There was a voting precinct located south of the Refuge for the hardy beach residents of Wash Woods. The registered voting population seldom numbered over 20. Their livelihood depended almost entirely on what could be eked out from a few free roaming cows, hogs, and chickens, but consistently the bay to the west and the ocean to the east kept them from starving. The world, to the Waterfield, Midgett, and Etheridge families, was not much larger than Wash Woods itself. Any quick travel to the mainland was by sailboat across the bay. Only when hardware or staples, such as flour or shotgun shells, ran low did they take a wagon up the beach and on into Norfolk. This usually involved a 2-3 day trip. Naturally, this type of trip was only done when absolutely necessary.

The late 1940's or early '50's saw the road to Sandbridge paved. Shortly thereafter the very few beach summer homes began to multiply. The real estate developers saw a chance to make lots of money and the buyers were beginning to have plenty to spend.

A four-wheeled drive vehicle was no longer exclusively a military truck. People had both money and leisure time to invest in a recreational vehicle. By 1958, the Back Bay Refuge Manager was looking to the near future when he recommended in a letter

to his Regional Office that we begin restricting vehicular access on our beach through the Refuge. The problems then were essentially that the fragile vegetation on the sand dunes was being destroyed by beach buggies charging up and over.

Also, the asphalt strip was edging even closer. By 1964, Princess Anne County had merged to form Virginia Beach, the World's Largest Resort City, 358 sq. mi. Many of the people took this slogan literally. It was a nice change of pace to grab a couple of 6-packs and take a drive on the beach. In 1967, the City of Virginia Beach paved a street right to the Refuge boundary, turned east across the barrier sand dunes and stopped paving at the high tide line. The City then posted a sign which prohibited vehicles on their beaches but by this time it was too late, the stampede was already off and running.

Virginia announced plans to establish False Cape State Park extending from the Refuge's southern boundary to the North Carolina line. The earliest preliminary discussions were of a resort-type development. Slowly the machinery was put into motion for legislative approval, but there were no firm development or access plans. The State Legislature agreed that False Cape would indeed make an excellent area for public beach-oriented recreation and authorized the funds for acquisition.

A real estate developer in Virginia Beach saw the area from the North Carolina line southward as a vast body of sand just waiting for someone to subdivide and conquer. With the financial backing of several investors, a section of the Outer Banks of Currituck County, North Carolina, approximately 5 miles in length from the ocean west to the Currituck Sound, was purchased, platted and offered for sale. The sales methods consisted almost exclusively of land sales contracts with monthly payments allowing up to 20 years to pay off. A review of Courthouse records shows that very few lots were actually deeded. So, for a few dollars down and a few dollars per month, one could be the proud owner of a piece of "The Banks", so long as one didn't miss a payment.

By 1969, the beach traffic and its attendant problems of litter, drunkenness, vandalism, car abandonment, accidents, theft, and assaults were totally beyond our abilities to control. As far as the City Police were concerned, their jurisdiction ended at our northern boundary. Traffic counts indicated that as many as 180 vehicles per hour were travelling through the Refuge along the beach.

This Refuge was in trouble. It was being completely overrun. After many losing attempts to

get the City of Virginia Beach to assist in enforcement of existing local and State laws, the Fish and Wildlife Service decided to impose restrictions on vehicular access through the Back Bay Refuge. A public hearing was held on May 18, 1970, to present the Service's proposals and to hear counter proposals. Over 1,700 persons, mostly irate beach enthusiasts, attended stating that they wouldn't have any restrictions imposed on them. The City stated that it would assist in enforcing the traffic laws, but not in limiting vehicular numbers.

The summer of 1970 and 1971 passed with ever-increasing traffic and associated incidents. The Refuge staff no longer had much of an opportunity to work as wildlife management personnel but instead worked as typical city traffic police. It became evident, when two employees were assaulted on March 14, 1971, that drastic measures had to be taken.

To be certain that all proper legal steps were taken, a Notice Of Proposed Rulemaking was published in the Federal Register on January 12, 1972, stating essentially that the Fish and Wildlife Service intended to restrict all vehicular traffic except for permanent residents living south of the Refuge, and a few minor categories.

It was also decided to draft and circulate an Environmental Impact Statement (EIS) to comply with the requirements of the National Environmental Policy Act of 1969. The draft EIS was prepared in April, 1972, dealing with the alternatives we faced, ranging from no action to total closure, but recommending limiting access to the following:

1. Residents and landowners in the False Cape State Park acquisition area.
2. Permanent year-round residents living on the Outer Banks of North Carolina in that area from the Virginia State line south to Corolla, North Carolina.
3. The school bus transporting children of False Cape residents to and from school.
4. Service vehicles on business calls and visitors of residents of the area listed in No. 1 and 2 above.
5. Other persons under permit from the Refuge Manager including, but not limited to, commercial fishermen who have verified their dependence upon egress, ingress, or crossing refuge lands for a livelihood.
6. Scientific and wildlife-oriented users.

The draft Environmental Impact Statement was circulated for comment and on December 29, 1972, the final EIS # FES 72-33, incorporating all the necessary revisions and comments, was at last cleared. The statement presented some interesting facts such as the total visitation to the Refuge in 1961 was 9,800, and by 1971, it had climbed to 348,000. The statement also showed that on one weekend, June 5-6, 1971, and this was not a holiday weekend, we had 9,200 visitors which was almost as many as was recorded during the entire year of 1961.

The total assessment did not predict what the environmental effects would be on areas outside of the Refuge, but it did show what was happening to the basic resource which we were charged with administering. There was a tremendous decline in shorebird use and diversity of species as the number of vehicles and people increased on the beach. Many biological impacts were discussed such as the effects of the trampling of vegetation on the sand dunes and subsequent "blowouts".

With the final Environmental Impact Statement completed, the Department of the Interior, Fish and Wildlife Service, published in the Federal Register under Title 50, Code of Federal Regulations, part 28.28, its long-awaited restrictions on vehicular access to become effective March 30, 1973.

The local opposition had been well prepared for this day. To the surprise of the Refuge staff there were no mass demonstrations nor attempts to ignore the regulations in effect. Instead there was a subpoena to appear in U. S. District Court. The Civil Action suit was on the docket as 143-73-N, Richard M. Coupland, et. al. vs Rogers C. B. Morton, Secretary of the Interior; Spencer E. Smith, Director, Fish and Wildlife Service; Richard E. Griffith, Regional Director, Fish and Wildlife Service; and Dennis F. Holland, Refuge Manager, Back Bay National Wildlife Refuge.

I had a rather lonely feeling when the plaintiffs' counsel stated at the hearing before U. S. District Court Judge John A. MacKenzie that they were prepared to have 1,400 named plaintiffs, but would for ease of recording just list 24 names. The first step was a request for a Temporary Restraining Order prohibiting enforcement of the regulations. This motion was denied by Judge MacKenzie. The City of Virginia Beach and an organization named Concerned Citizens for Conservation and Recreation requested to intervene on behalf of the plaintiffs. This was allowed.

We were represented by the U. S. Attorney's

Office, and receiving permission to intervene on behalf of the defendants were 16 organizations. Among them were the National Audubon Society, The Wilderness Society, Environmental Defense Fund, and the National Parks and Conservation Association.

A hearing was set for April 20, 1973, at which time testimony was heard. The first witness called by those seeking to prohibit enforcement of the regulations was a very astonished defendant Refuge Manager, namely myself. The hearings carried over the weekend and on April 23, Judge MacKenzie made a personal inspection of the Outer Banks by vehicle and by helicopter.

On April 27, 1973, a limited temporary injunction was ordered by the Court expanding our regulations to include additional categories:

1. Those owners of "Improved property", with a habitable dwelling, and one guest vehicle per day.
2. Owners of unimproved property; one trip per month.
3. Workmen engaged in the completion of dwellings under construction and maintenance of existing dwellings.
4. Real Estate salesmen.

We were swamped with applications under the injunction, but we were operational with the new system within one week. As could be imagined, the number of permittees continued to climb as did abuses of the additional limited privileges. Our two enforcement employees were being pushed to the limits of their patience by constant arguments. They were regularly challenged with the argument that the limitations placed on landowners were unconstitutional and that the Department of the Interior would lose. The number of violations dropped slightly; however, successful court prosecutions dropped significantly. The lower court would not prosecute violators of permit regulations issued under the injunction. These cases would have to be heard in U. S. District Court.

Finally, after several postponements, the trial was started on November 5, 1974. The plaintiffs had contested that the regulations were invalid on these points:

1. The regulations were discriminatory.
2. The regulations went beyond the authority of the Secretary of the Interior.

3. The EIS failed to comply with the National Environmental Policy Act.
4. The regulations were vague and indefinite.
5. The regulations failed to comply with the Administrative Procedures Act.
6. The Secretary of the Interior didn't have the authority to issue closure regulations under the Migratory Bird Conservation Act.
7. The United States didn't own the intertidal zone, thus the Government's attempts to control it were invalid.

Judge MacKenzie disposed of their contentions and gave his ruling in favor of the United States on February 26, 1975, in one of the strongest opinions our agency had ever received. He dissolved the injunction and left our refuge regulations in full effect.

The plaintiffs appealed the U. S. District Court decision to the Fourth Circuit Court of Appeals which sits at Richmond, Virginia. This time the plaintiffs challenged Judge MacKenzie's ruling on only two points, which are quoted from the lead paragraph in the Appeals Court ruling: ". . . Before us, their [the plaintiffs] attack on the regulations is two fold: First, they contend that the environmental impact statement prepared by defendant prior to restricting access to the Refuge by motor vehicle was inadequate, especially in its failure to consider the effect on the ecology of substitute means of access to lands lying south of the Refuge should access through the Refuge be restricted. Second, they argue that the State of Virginia retained title to a portion of the shoreline of the Refuge so that the Secretary had no legal right to restrict passage."

The clincher is found in the first line of the very next paragraph. "We see no merit in either contention . . ."

Thus, the Department of the Interior had now received the higher court ruling upholding the Secretary's authority to protect our National Wildlife Refuge system from the abuses of public use.

The legal battle had been won on one particular piece of beach. Your Section 306 efforts may very well face the same intense pressures and legal fights we have encountered.

At the Back Bay Refuge we have clearly seen that public use patterns on our beach are directly related to vehicular access. Once all traffic was routed off our north mile of beach, the number of swimmers dropped by two-thirds, with 95% of the remaining

use occurring in the first 1,000 feet of beach. When people were permitted to drive and park on the beach, the entire mile would be literally covered with people and parked cars, except for the routes that through-traffic were using.

Your jobs are going to be most difficult when you attempt to restrict an ongoing activity. The reasoning behind the restrictions will have to withstand close scrutiny by political bodies and quote possibly the judiciary. Obviously, you must have good public support for your actions.

Based on my experience at Back Bay over the last four years, I wonder how our coastal zones would be today if P. L. 92-583 had been implemented 20 years ago.

Thank you for the privilege of sharing some of the problems that the U. S. Fish and Wildlife Service has had to face and resolve in managing just one Coastal Refuge. I can assure you that it certainly isn't easy. I hope that we all can benefit from what each participating member has to offer.

## FREEING THE BEACHES: IS IT POSSIBLE?

By **ROBERT M. BAKER**

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*Bureau of Outdoor Recreation  
Atlanta, Georgia*

One Sunday morning in Hartford, Connecticut, a group of black children and their mothers are loading into a bus for a day at the beach. Among the conspicuous white faces in the crowd one stands out; it seems to be directing the operation. It is ironic that this scene is taking place in Hartford because just as black people from the inner city are being bussed out to the open air to enjoy the blue waters of Long Island Sound, during the week white kids from the suburbs, enrolled in a YMCA urban awareness program, lurk through downtown streets, an environment quite alien to the youth of the suburbanite middle and upper classes.

The bus departs Hartford and heads south toward the breakers and the beach. This is no ordinary Sunday outing to a public beach, an event which occurs many times yearly at Asbury Park, Myrtle Beach, or Fort DeSoto Park in Pinellas County, Florida. The passengers on the bus and their leader, Neal Coll, are out to prove a point; they are out to sun and bathe on publicly owned property, but that which is below the mean high tide line. The land above the high tide line is in the hands of private owners, usually a club or a closed community, which years ago claimed exclusive rights to the beaches. Getting to the public area is a chore because access is severely limited. Ideally the shortest route would be across private land, but that would mean trespassing. Instead, entrance is achieved by various means, by boat, across a jetty or groin, or via land owned by a supportive private landowner. Once the entourage finally disembarks on the "publicly owned" land, curious onlookers peer out their windows at this once curious sight which has become all too familiar along the Connecticut coast.

As Coll and his retinue descend on the beaches, the local constabulary confronts the interlopers and remind them of their rights. Coll acknowledges the official proclamations and exhorts more of his group to enjoy the "public beaches". These confrontations have become more and more frequent over the past 3 years. No longer are Coll and the legions from Hartford aliens to the playgrounds of the exclusive beaches of Connecticut. With each visit the local citizens are unable to accept the presence of

the ragamuffin horde.

Two of Coll's objectives have been attained: access and use of the beach, even if in a limited sense. Many other problems arise during the day's activities, among them the lack of fresh drinking water and the absence of lavatory facilities. Occasionally a hospitable beach dweller offers the use of his services to the interlopers. More often, though, the excursions to the beach prove a trying experience to adults and children alike or at least until a public area is found.

Coll and his entourage attempt to visit three or four beaches on a Sunday; each area possesses its own unique set of impediments and obstacles, but the weary band seems to overcome most of these. Finally the busses depart the exclusive shoreline domains headed for Hartford, only to return the following Sunday.

I relate this colorful episode to you because it aptly describes a fundamental dilemma regarding public use and public access of this Nation's beaches and estuaries. Of the 12,150 miles of beaches in the United States (excluding Alaska), only 6.5 percent are held in the public domain and only 4 percent are open for recreational purposes, a pitiful percentage considering the great demand for salt water based activities and the fact that more than half of the Nation's population resides within 50 miles of the coast. Thus, public consumers seriously overtax the capabilities of the resources.

Since 1842, the U. S. Supreme Court has wrestled with the problem of ownership of the shoreline. In 1935 it promulgated the mean high tide line test which averages all the high tides during the year and essentially demarcates private from public ownership. However, no Federal law exists which permits the public right-of-way over private lands in order to reach the shore. In other words, the public can only exercise the two options which Neal Coll and his retinue have at their disposal. One can enter from the water side or pass along the shore staying below the mean high tide line. Several States have filled the void of Federal jurisprudence. The State of California guarantees public access over any road or path leading to the water. A State Supreme Court decision in Oregon mirrors the legal

decision in California, claiming that public recreation is a customary use of the shoreline. In the Northeastern States, on the other hand, private rights are strongly upheld. Armed security officers and fences insure that the shorelines are relieved of the general public. In the Southeast, we may generally say that the private beaches far outnumber those available to the public; beaches often are reduced to a very narrow strip or practically nothing as the case of the beachfront motels in Miami Beach. The Bureau of Outdoor Recreation (BOR) does not advocate total public ownership or complete access to all the beaches and estuaries; however, we do support the public's right to greater opportunities to the beaches and estuaries.

Since the inception of the Land and Water Conservation Fund in 1965 the Bureau's Southeast Regional Office has funneled nearly \$31 million of Federal funds into State and local coastal or shoreline acquisition and development projects. This \$31 million has been matched or exceeded by State or local funding. Projects include those in the Carolinas, Georgia, Florida, Alabama, and Mississippi. All totaled, the Atlanta BOR office has contributed to 129 coastal projects ranging from the construction of fishing piers and boat ramps to the acquisition of Caper's Island, South Carolina. Another way in which the Bureau contributes to the acquisition of beaches, and access to those beaches, is through the Federal Surplus Property Program and the Legacy of Parks Program. We have assisted in the transfer of 15 properties in the coastal areas totaling over 2700 acres. This includes 8 miles of shoreline frontage.

One particular piece of property presents a unique, perplexing problem. Many of you may be familiar with the Don Cesar Hotel in St. Petersburg Beach, Florida. Originally constructed in the early part of this century as a grand hotel, the metamorphosis that this structure has experienced in the last 40 years is simply fascinating. It has catered to the Veteran's Administration, wounded military personnel, other members of the Federal bureaucracy and quite recently it assumed the role of a hotel for hobos, hippies, and hounds. Finally, it has reverted to its original form, a stately, grand hotel. The Federal Government still retains some property adjacent to the structure, but no longer has any use for it. The city has requested transfer of this property into its domain as an access strip to the sandy shoreline of St. Petersburg Beach. A group of local citizens, predominantly neighbors of the Don Cesar have voiced strong opposition to this action.

They advocate that the hotel buy the property, thereby insuring the integrity of the Don Cesar, but concurrently eliminating the general public's ability to reach the beach. It is an intriguing battle, one in which both sides present convincing arguments. Fortunately or unfortunately, the Bureau must pass final judgment on this puzzler.

What can we do then, what actions can be taken to free the beaches; to open up the shore for the public, to insure that beaches normally open to the masses remain in the public domain? I think we can identify two edemic problems, quite interrelated, yet sufficiently unique to be treated differently. On the one hand, how can rights to beaches already used by the public be retained by the public? On the other hand, I want to address the problem of gaining rights to new land; I have described BOR's grant role in this, now I wish to discuss other general techniques.

The first concept dealing with retaining property within the public domain is the idea of public trust; i.e., the public has certain rights granted to it by the State in practically every coastal acre. The problem arises when the State has seen fit to dispose of trust properties to private properties. This is perfectly legal as long as the public's welfare is furthered or safeguarded.

Several States in the Southeast have recently asserted this public trust doctrine in the claim to its coastal areas. South Carolina has claimed 450,000 acres of tidelands in and adjacent to navigable waters. In 1970, the Attorney General of Georgia announced the State's claim to marshlands. The Florida code recently has been amended to include natural resource conservation under the public trust.

The public trust doctrine may also apply to a situation where the impediment to public use is not physical, such as a strip of private upland, or an intervening jetty, but rather the imposition of discriminating fee. The practice of charging excessive fees is found more popularly in the Northeast than in any other part of the country, but the public here in the South nevertheless should exercise extreme vigilance. The court ruled in the New Jersey case (Borough of Neptune City vs. Borough on Avon-by-the Sea) that because the uplands are dedicated for recreational use, the beach and the open waters must be open to all on an equal basis and without preference. Any contrary actions are impermissible. In this case the court displayed a willingness to alter the interpretation of traditional concepts to face the challenges of new

situations in modern times.

Another interesting concept designed "to hang on to what you got" is "Implied Dedication." This is a common law device which governs donations of land to public use. Once the original offer is accepted, then the compact is sealed. The owner cannot revoke the dedication, nor can the public lose its rights through nonuse. A change in ownership would not even prevent this.

Depending on the State, implied dedication may not be an effective device to preserve the public's rights; instead adverse use may prove to be the key. Adverse use may be best explained by a court case (Dietz vs. King) wherein the public believed it had the right to enter land without anyone's permission. The court in this instance recognized a claim opposed to the interests of the owner. The public, in fact, had demonstrated a continual use of the property, a use which had not been interfered with by the owner. Public need was proven; by the same token inaction was shown by the owner.

Another effective device is one utilized by the State of Oregon: Customary rights. Public use of the beaches had existed for as long as the public claimed property rights in the locality. Therefore, the courts interpreted that long time use as being in the public interest and thus irreversible; this customary right to recreation precludes a private owner from excluding the public.

The city of Daytona Beach, Florida, several years ago, employed another device to insure the public's right to the beach. A prescriptive right governs the creation of a public easement on privately owned land. The public's use of the private land must be clearly visible, or be performed with the complete knowledge of the owner, and must be adverse to the owner's use and enjoyment. If you recall in Daytona, the owner of the beach front desired to construct an observation tower on private land. This land had been used by the public extensively for 20 years; in fact, the city patrolled this area and had been empowered to construct lifeguard towers. The courts prevented the construction of the observation tower because the public had successfully demonstrated an adverse use. The enforcement of the prescriptive rights doctrine has also been successfully applied in a landmark Texas decision (Seaway Company vs. Attorney General of Texas).

All of the methods which I have just discussed are applicable to situations in which the public has already asserted its claim to the beach areas, but what of means to insure that new areas are made available to the public? I have already mentioned

the Land and Water Conservation Fund and the Legacy of Parks Programs. Besides these actions the Bureau sees its role in the coastal zone management program as:

1. Identifying existing marine resources and suggesting sites for future acquisition, public access, and so on.
2. Developing guidelines for multiple use of coastal lands.
3. Participating in task groups to develop policies and practices to resolve management problems and conflicts of interest related to coastal zone management.
4. Encouraging State and local governments to accept more responsibility for recreation resource preservation, conservation and appropriate use of the coastal zone.
5. Defining the role and responsibility of the private sector for coastal zone use, management, and development.
6. Emphasizing objectives for preservation of coastal ecology, natural areas, marine sanctuaries, cultural and historical values, and public access, and managing use limitations in implementing Nationwide Plan actions.
7. Developing public awareness of resource conservation needs and appropriate uses of marine resources, through existing education systems and research programs.

Localities can exercise a number of options in gaining access to beaches and acquiring more shore land for the public. I'll mention these briefly and then discuss the potential viability and success of these methods. One method which is being utilized primarily in non-coastal settings is the subdivision exaction, that is a requirement that forces a developer to dedicate a public easement where a subdivision would block existing or potential access.

Exclusive Use Zoning constructs a special zoning district which permits just recreational and ancillary open space uses. This type of device could be appended to a special taxing technique which permits the adjustment of property taxes due to the public's use of the land for recreation. Donations of land might be encouraged by demonstrating the potential tax advantages.

Building setbacks permit the regulation of only a portion of the property thus leaving the balance to the discretion of the owner.

Finally in the case of Compensable Regulations, the State regulates land then compensates certain landowners for losses suffered. This way the Fair Market Value of the property is guaranteed to the property owner.

In all of the cases the courts may rule favorably under two circumstances: (1) the broad umbrella of public safety, and (2) the preservation or conservation of a unique natural area. The courts are particularly concerned with the prevention of public harm. The construction of a subdivision, cutting off all access to a beach may be interpreted as performing public harm. Conversely, a regulation involving the total infringement of private property rights, would probably not enjoy a long life. Instead, the regulation must walk a thin line

and balance carefully both public and private rights. Regulatory actions are assured a greater chance of success if it concurrently permits the private landowner some economic uses for the land while tightly restricting the uses so as to achieve public objectives.

The whole issue of the public's right to the beaches and of access to the beaches has taken on a broader meaning. An eminent law professor at the University of Michigan, Joseph L. Sax, views all these land use regulations as a legitimate exercise of police power, an exercise "in vindication of public rights." Yes, something can be done to gain more access and more beaches for the public, either through the courts or through Neal Coll.



# THE ROLE OF INTERSTATE COMPACTS IN FISHERIES MANAGEMENT

By IRWIN M. ALPERIN

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*Atlantic States Marine Fisheries Commission  
Washington, D. C.*

This is my first visit to a Coastal Plains Center Conference and perhaps my first knowledge of the Coastal Plains Regional Commission. I find that we have much in common—namely, people and purpose.

The Atlantic States Marine Fisheries Commission (ASMFC) shares with the Coastal Plains Regional Commission 5 States, Virginia to Florida, which make up one-third of our Commission:

Jim Douglas, of Virginia, the Chairman of this Session is the immediate past-Chairman of ASMFC; Dave Gould, a member of this panel, Supervisor of Coastal Fisheries here in Georgia, is a past-Chairman of ASMFC; Ed Joseph, of South Carolina, who made a presentation yesterday, is the current Chairman of ASMFC; Bill Hargis, of Virginia, who also addressed you yesterday, is the Co-Chairman of the ASMFC Advisory Committee; and Ed McCoy, of North Carolina, who is on the agenda but could not make the meeting, is also an Administrative Commissioner in ASMFC.

The comments that I make this morning are entirely my own and not in collusion with any ASMFC Commissioners, but perhaps if there is time and you have the inclination, the ASMFC Commissioners present might answer questions on how they view the Commission's role if it differs from my version.

For those who may be uninformed about the relations and structure of the interstate marine fisheries compact commissions, let me provide you with a brief background. There are three interstate marine compacts granted the consent and approval of Congress: the Atlantic States Marine Fisheries Commission, with fifteen member States; the Gulf States Marine Fisheries Commission, with five member States; and the Pacific Marine Fisheries Commission, also with five member States. ASMFC was the first to be created in 1942 and the others soon followed. Each State within a commission is represented by three delegates or commissioners — a State fisheries director, a member of the State's legislative body, and an appointee of the Governor. (Florida, incidentally, is a member of both the Gulf and Atlantic Commissions.) All three

commissions have advisory bodies, although their composition varies. The Federal fisheries agency, presently the National Marine Fisheries Service (NMFS), is designated as the primary research agency of the Gulf and Atlantic Commissions but is not so named in the Pacific compact.

The purpose of the Atlantic States Marine Fisheries Compact, with which I am most familiar, is to provide for the better utilization of the fisheries of the Atlantic seaboard. It shall do this, reads the compact, by development of joint programs for the promotion and protection of these fisheries and the prevention of physical waste from any source. The other compacts have similarly worded prefaces. But the commissions are not granted any regulatory (or management) authority to achieve this, with one exception that I will refer to a bit later, and so must act as agencies of inquiry, of debate, and of recommendation — in the latter case to the several legislatures, to the governors, to the State administrative and management agencies, and presumably also to the Federal fisheries agencies and the Congress. And essentially this is how the commissions have operated until now — with individual embellishment, of course, over the years, providing both services and support to member States as regional needs and changing times have dictated.

In 1950 Congress granted an amendment to ASMFC which provided that any two or more consenting States could designate the Commission as a joint regulatory agency with respect to specific fisheries in which such States have a common interest. This is an interesting concept for interstate management of shared fisheries resources because some States do not even have the constitutional authority to make interstate agreements for fisheries. Unfortunately, until very recently these provisions were never invoked. And perhaps now it is too late. Almost positively, this regulatory function so long neglected, so badly needed, will be preempted through the Federal legislation that is before the Congress today.

But since the Commissions were not granted any powers to make or enforce regulations, except in the

special case made above which, incidentally, requires individual State ratification (only 9 of 15 have done so in ASMFC in the past 25 years), what could have been the Commissions' role all these years? It seems to me essentially to recommend to the several States involved with any species of fish regulations appropriate to the protection and optimum utilization of such species for simultaneous legislative or administrative enactment. In this idealized concept the compacts thereby afford a method for a constructive joint approach by States to common problems of management that the States operating individually cannot solve. Additionally, in two of three instances, and for practical purposes, today, in all three cases, the compacts recognize the Federal interests by providing for Federal agency participation and mutual support. Nevertheless, the compacts preserve States' responsibilities by requiring the commissions to report their recommendations to the several States affected by any problems for final action by them. Finally, I believe the compact commissions were designed as practical institutions in that they create no super government agency but utilize existing State and Federal agencies in a common effort to solve problems that are unsolvable otherwise. That they have been unable to resolve many of these problems stems from political and human frailty — one cannot fault the compacts.

More recently the interstate compact commissions have come forth in support of a new initiative of the National Marine Fisheries Service called the State-Federal Fisheries Management Program (SFFMP). The commissions play a supportive role in communications, planning, coordination, and administration of the SFFMP, under which fisheries management plans are being prepared for a number of important target species on each of the coasts. These include northern shrimp in the Gulf of Maine, southern shrimp in the South Atlantic States, the surf clam and northern lobster in north and middle Atlantic areas, menhaden in the Gulf of Mexico, Dungeness crab and other selected species on the West Coast.

ASMFC has gone one step further with the Gulf of Maine shrimp and, combining the management planning of the SFFMP with the provisions of Amendment No. 1 to our Compact, has organized a Northern Shrimp Section which promulgates regulations for this fishery. Three states, Maine, New Hampshire and Massachusetts, share this fishery. Most of the fishery is conducted beyond the territorial sea of the individual States, in fact,

outside the U.S. contiguous fishery zone. Based on studies of a State-Federal scientific team and policy decisions of a State-Federal subcouncil of the Northeast Marine Fisheries Council (a regional council composed of eleven State administrators and the NMFS regional director), the Northern Shrimp Section promulgates regulations which are then adopted by ASMFC. To date these regulations include an optimum mesh size to conserve the small androgynous male shrimp and a closed season to help control annual landings which are above Maximum Sustainable Yield (MSY). This is a cooperative effort involving the Commission as a regulatory (management) institution, with State and Federal administrators and scientists providing financial and technical input while the states practice cooperative reciprocal enforcement. I believe this system could be a practical solution to regional fisheries management for a considerable number of inshore and estuarine-oriented species and should be more universally applied; but, as I stated above, it may have developed too late in the scheme of things unless we can adapt it to fisheries that are predominantly inside the 3-mile limit but passing through invisible State boundaries.

There is an immediate potential use of this management system in the area of interest of the Coastal Plains States organization. As I mentioned earlier, the State-Federal Fisheries Management Program has as its goal effective management of fisheries through cooperative regional conservation, protection, and utilization of resources, and one of the resources identified as of the highest priority in the South Atlantic Coastal area is the Penaeid shrimps — white, brown and pink. Under the aegis of the State-Federal Program, in early 1973 a Technical Committee for Shrimp Management was organized with representation from the Federal fisheries agency (the National Marine Fisheries Service) and the marine resources agencies of North Carolina, South Carolina, Georgia, and Florida — with the South Carolina Division of Marine Resources serving as the prime contractor for Federal funds contributed to the Program. With input from all four member States participating, the group compiled and published in September 1974 a Management Planning Profile of the Atlantic Coast shrimp fisheries. This profile identifies a need for a policy plan for the implementation of regional shrimp management in the four State area. To accomplish this, the Committee formed a planning team which produced a Regional Shrimp Management Plan in June 1975. Two specifics of this planning effort relate to the Atlantic States Marine

Fisheries Commission's potential role in regional fisheries management. First, there is a recommendation that the South Atlantic States Fisheries Management Council (in the SFFMP) be composed of one representative from each member State but identifies these individuals as the Administrative Commissioners appointed to the ASMFC. Secondly, it is recommended that the States of Florida, Georgia, and South Carolina adopt Amendment No. 1 to the ASMFC Compact, North Carolina having done so already.

In effect this could lead to the implementation of management recommendations of the shrimp plan by a regional council composed of administrators from the four States that utilize the resource and simultaneous adoption of regional rules and regulations by a newly designated Section of ASMFC — the Southern Shrimp Section. I believe this arrangement has considerable potential for an effective regional management system where States have difficulty enacting comparable statutes or issuing uniform regulations even though the need is demonstrated.

We have now before us the era of fisheries management under extended jurisdiction. Both House and Senate versions of bills currently before Congress provide for regional management councils that will develop management plans for stocks of fish throughout their range. The House version, the "Marine Fisheries Conservation Act of 1976" (H.R. 200), even has preemptive language that would enforce regulations within the territorial sea which up to now has been the prerogative of the individual States. Interestingly, the House bill takes cognizance of the interstate commissions and includes the executive director for the geographical area as a Council member. The Senate bill, the "Magnuson Fisheries Management and Conservation Act" (S.961), has no provision for marine fisheries commission input per se but its accompanying report suggests that the commissions will provide staff support to the regional management councils.

And what about the individual States? ASMFC passed a resolution as early as 1969 favoring extended fisheries jurisdiction. When the original Studds-Magnuson bills, which provided for interim extended fisheries jurisdiction but with no management provisions, were introduced in the 93rd Congress, the ASMFC states voted 14 to 1 (Florida dissenting) in favor, but that was two years ago. These same States respond somewhat differently today. They have reservations. Now that the bills before Congress have management titles, and

especially certain provisions of H.R. 200, the States are seeking amendments or at least trying to affect what comes out of Congressional conference that will favor States' rights and States' needs. The States are opposed to the ultimate powers vested in the decisions of the Secretary of Commerce and are most emphatically perturbed over potential preemption of fisheries within the territorial sea. They are dismayed by the large Council structure that includes user-group participation. They feel that Federal licensing will deprive them of funds upon which they depend to support their own fisheries research and management programs. On the other hand, the States are in favor of Regional Councils with strong management responsibilities and powers but only if the State directors are included as members. They recognize that on the key issue of initiative and authority for the Councils S.961 accords them a stronger role than does H.R. 200, but S.961 does not specifically guarantee their membership on the Council; the amended version of H.R. 200, as passed by the House, now does. They are pleased with the language of S.961 which specifies that the Secretary of Commerce shall review management regulations recommended by the Councils (as well as accepting their management plans) and the Secretary shall adopt such regulations (when consistent with national standards) for the management of the fishery involved. They are displeased with this as part of H.R. 200 which is weak in regard to the above, granting the Secretary powers without "due process."

Finally, what might be a role for the interstate marine fisheries commissions in the new era of fisheries management under extended jurisdiction? Let me quote to you from a letter to Senate Commerce Committee Chairman Warren Magnuson by John Harville, Executive Director of the Pacific Marine Fisheries Commission. "With respect to designation of an appropriate role in this new management regime for the present interstate marine fisheries commissions, I believe this should take the form of staff support for the Regional Councils, after the pattern already in effect with respect to NMFS's State/Federal Fisheries Management Program . . . I urge that the legislation . . . specify that kind of relationship and thus recognize past achievements of the marine interstate fisheries commissions in communications, planning, and coordination of State-Federal interactions, and Commission capabilities to apply existing experience and institutional machinery to facilitation of the new Regional

Council management functions."

Dr. Harville goes on to say "I think it important that the Congress be on record in calling for this kind of adaptive evolution of the interstate marine fisheries commissions. The Congress created those Commissions in the late '40's to assist the States to work more effectively together on shared fisheries problems. The quarter-century since that creation has expanded both State and National needs, and our institutions should evolve accordingly."

I am in accord with that view. While providing staff support to the Councils, the Commissions must not be absorbed into the new Councils. The Commissions would continue to provide the States with a communicating mechanism with one another and with the legislative and executive branches of the Federal Government. The interstate

compacts should retain their identities as State-funded and State-governed entities for continuation of their many present services to the States, to the Commission associates and their regional constituencies, and to the Nation, aside from any role in fisheries management.

If regional management is truly upon us, there are only the three alternative roles for the Commissions: (1) they might be abolished as no longer needed; (2) they might disappear into the Council structure; (3) or they should, as I believe, be continued for all the other services provided to their member States while developing through contract staff support a relationship to the councils similar to that performed within the State/Federal Fisheries Management Program. This latter role should be the rational choice.

# STATE-FEDERAL MANAGEMENT PLANNING FOR MARINE FISHERIES: TODAY AND TOMORROW

By **RICHARD H. SCHAEFER**

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Today, in the brief time allotted me, I would like to discuss with you some perspectives on current and future planning concepts related to the State-Federal management of our Nation's marine fisheries resources.

On several occasions this morning, you have heard reference made to the National Marine Fisheries Service's (NMFS) State-Federal Fisheries Management Program. Many of you at this gathering, especially the fisheries administrators, managers, and scientists from the coastal States, are already thoroughly familiar with the State-Federal Program, including its objectives, institutional arrangements, and operating mechanisms. Indeed, many of you are active participants in Program activities. At the risk of boring that segment of the assembly, I feel it would be useful for the purposes of this discussion to very briefly provide a Program overview to those of you less familiar with it.

The State-Federal Fisheries Management Program, as now conducted, is an evolving experiment in the cooperative management of interjurisdictional fisheries. In the context of the Program, fisheries management can be defined as the establishment, administration, and enforcement of regulatory regimes, developed and maintained through the acquisition, analysis, and application of relevant resource and fisheries data, which will provide for the conservation, rehabilitation, and rational utilization of fisheries resources. The Program was created to prime and catalyze the development and implementation of effective management plans for fisheries resources over their entire geographical ranges of distribution. Therefore, close intergovernmental cooperation between and among the States and the Federal Government in management planning, regulation, and enforcement regarding commonly shared fisheries resources, is a Program requisite.

The program was formally established in 1971. It was born, and continues to evolve, out of a recommendation made in 1969 by the President's Commission of Marine Science, Engineering and Research, otherwise known as the Stratton Com-

mission. Charged with undertaking an intensive investigation into a broad array of marine problems, the Commission observed, with regard to our nation's fisheries, far too many cases of outmoded fleets, excessive harvesting capacities, overexploited stocks, declining catches, user conflicts, high unemployment, low incomes, etc. It concluded that these conditions could be systematically traced to two basic causes:

1. That fisheries resources are considered common property and available to all.
2. That fisheries resources migrate across domestic and international boundaries and therefore are regulated (or not regulated) under split or multiple jurisdiction, with generally no single focus of management responsibility.

Among other things, the Commission suggested that the rehabilitation of domestic fisheries depended on the elimination of overlapping, and often times conflicting, laws and regulations which have tended to impede even those fisheries which were economically viable. It recommended "A definitive review and restructuring of fisheries laws and regulations, and the creation of a new framework based on national objectives for fisheries development and the best scientific information". Thus, the State-Federal Fisheries Management Program.

As I suggested a few minutes ago, the goal of the State-Federal Fisheries Management Program is to effect the rational management of domestic interjurisdictional fisheries through the development and implementation of comprehensive fisheries management plans so as to optimize social, recreational, and economic benefits on a sustainable basis. The principal objectives to attain this goal are:

1. To develop and maintain an institutional structure that facilitates cooperative State-Federal Management planning and action, with advice from resource users.
2. To develop and promote appropriate legislation that provides the necessary regulatory

authority to effectively manage fisheries.

3. To design and implement appropriate Program policies and planning guidelines that provide for shared decision-making and positive, timely management action.

In essence, Program goals and objectives will have been achieved when there is optimum utilization of biological stocks on a sustained basis; when commercial fisheries are economically viable; when recreational angling opportunities have been enhanced; and when the American consumer is provided with a continuous supply of high quality seafood products.

To date, much has been accomplished and much experience has been gained through Program operations. Yet, we have barely scratched the surface of the problems associated with achieving effective management. Let me just briefly describe to you what has been done to date.

With regard to the first Program objective, i.e., developing and maintaining an institutional structure, State-Federal Fisheries Management Councils have been established in each of the five National Marine Fisheries Service regions distributed around the coasts of the United States. Consisting of key fisheries administrators from coastal States in each region, and the Regional Director of the National Marine Fisheries Service, these Councils function as joint State-Federal recommendatory and decision-making bodies at a policy operational level. As currently practiced, it is the responsibility of these Councils to identify appropriate Fisheries resource "targets" for joint State-Federal management, to jointly effectuate the development and implementation of comprehensive management plans for those "target" resources; to establish appropriate working committees of planners, biologists, economists, social scientists, etc.; to develop the management plans under Council guidance; and to adopt and implement such plans, to the extent possible, including the promulgation of appropriate regulations and their enforcement through the authorities of the individual States represented on the Councils. Since mid-1972 when the American lobster was identified as the first State-Federal fisheries management "target", nearly 1.5 million dollars of Federal Program funds have been provided to support the operations and activities of Regional Councils around the nation, including expenditures for planning, travel, and data acquisition.

In addition to the American Lobster, six other

fisheries resources, or resource "complexes" have also been designated as State-Federal Management "Targets". These are the northern shrimp in the Gulf of Maine, the surf clam of the Mid-Atlantic coast, penaeid shrimp in the South Atlantic states, menhaden in the Gulf of Mexico, certain coastal fishes of southern California, and the Dungeness crab on the Pacific Coast. In addition, Alaskan King and Tanner crab, Pacific Coast shrimp and Pacific troll salmon are also under serious consideration as near-future State-Federal Management "Targets". Phases of management plan development and implementation vary considerably at this time from fishery to fishery, i.e., from merely "target" identification in a few, to completion of plan development and partial implementation of regulations in others.

So much for the current evolutionary status of the State-Federal Fisheries Management Program. What, however, might we expect the future to hold in store?

From the very early development of the State-Federal program, it was recognized that rapid achievement of its major goals and objectives would be hampered by several critical constraints. One of these constraints is the lack of effective regulatory authority in many States and at the Federal level. Another is the absence of a clear Congressional mandate for the State-Federal program. Enactment of certain legislative proposals currently under consideration by the U.S. Congress, however, could soon alter the situation significantly.

As you are doubtlessly aware, the United States currently maintains a 3-mile territorial sea and a 9-mile contiguous fisheries zone along its shores. Under the submerged Lands Acts of 1953, the Federal Government granted exclusive management authority to the States over fisheries within their respective jurisdictions. On the contrary, except for restrictions on foreign fishing within the contiguous fisheries zone, and enforcement of U.S. fishing activities on the high seas under international agreements, the Federal Government has no similar management authority to match that exercised by the States. There is, however, considerable interest at the present time throughout the United States to extend the fisheries jurisdiction to 200 miles, and simultaneously provide the Federal Government with management authority within the zone seaward of 3 miles. The administration supports such an extension of fisheries jurisdiction, but only insofar as that can be achieved

by multilateral agreement through international Law of the Sea negotiations. On the other hand, it is evident that the U.S. Congress is becoming increasingly impatient and is prepared to act unilaterally, if necessary, on this issue. HR 200, which has already been passed by the House of Representatives, and S.961, which yet requires final action by the Senate, each provides for a 200-mile U.S. fisheries zone, and for the exercise of Federal management authority within that zone. However, with the exception that HR 200 provides for Federal preemption under certain unusual circumstances, neither piece of legislation would diminish existing State fisheries management authority within the 3-mile territorial sea. Significantly, if enacted and signed into law, such legislation would also provide the long-sought, specific legislative base for the State-Federal Fisheries Management Program. In other words, it would appear that the State-Federal Program stands on the verge of transformation from its current "ad hoc" status to a legislative mandate from the U.S. Congress. "State-Federal" would become the fundamental mechanism for the management of marine fisheries within the zone of extended jurisdiction.

While it should be fully recognized that the ultimate legislation could well contain provisions different from those which I would like to bring to your attention at this time, there is sufficient similarity between HR 200 and S. 961 regarding fisheries management planning to reasonably anticipate agreement in this area by Senate and House conferees. I want to stress, however, that this is merely supposition on my part.

Two general areas of the bills specifically pertain to fisheries management planning:

1. Regional Marine Fisheries Councils, which are the management institutions responsible for developing fisheries management plans and recommending regulations; and,
2. Preparation of fisheries management plans and management programs.

#### REGIONAL MARINE FISHERIES COUNCILS

Both bills envision the formal establishment of seven Regional Marine Fisheries Councils, although their geographical configuration differs somewhat. Council composition also varies between the two bills, both by representation and by numbers of members. Indications are that Councils will probably consist of State officials from each of the member States, one or more Federal represen-

tatives, and representatives from the private sector. It is a further probability that each Council will be provided with or have access to, scientific, technical, and other support personnel as necessary in order to function efficiently and effectively.

#### MANAGEABLE UNITS

One of the initial tasks of the Councils will be to identify those fisheries in need of conservation and management. Any Council, coastal State, the Secretary of Commerce, or member of the public would be able to nominate a fishery as being in need of conservation and management.

Next, the actual manageable unit would need to be identified, for which a fisheries management plan and regulations will be required. In this context, the manageable unit may be a species, stock, geographical grouping, or any other logical delineation capable of being managed as a unit.

It should be pointed out that the Senate bill also mentions the need for a Council to develop an area management plan, with separate programs for each fishery within its respective geographic area of authority.

#### FISHERIES MANAGEMENT STANDARDS

Both bills require that fisheries management plans developed by Councils be consistent with National fisheries management standards. These standards are enumerated as follows:

1. Management and conservation measures will be based on the best scientific information available.
2. To the extent possible, an individual fish stock shall be managed as a unit throughout its range.
3. Management and conservation measures shall not discriminate between residents of different States.
4. Management and conservation measures shall be designed to achieve the optimum yield of a stock on a continuing basis.
5. Management and conservation shall promote efficiency in harvesting techniques.
6. Management and conservation shall be formulated to allow for unpredicted variations in fishery resources and their environment and for possible delay in application of such measures.

7. Management and conservation shall be designed to minimize research, administration, or enforcement costs—and avoid unnecessary duplication.
8. Management and conservation measures shall be designed to prevent depletion of fisheries resources.

#### ACTIONS AFTER PLANNING

When Councils have completed and approved fisheries management plans and proposed regulations, they would be submitted to the Secretary of Commerce for review (in consultation with other Federal Agencies), modification (in cooperation with Councils), and implementation.

After the Secretary has approved the plan, the plan together with proposed regulations to implement the plan would be published in the Federal Register. Should no objections arise to the proposed rulemaking, the Secretary would promulgate the regulations to achieve the management and conservation measures outlined in the plan. Should objections be raised to the proposed rulemaking, the Secretary would hold a public hearing prior to promulgating regulations.

In the Senate version only, an independent Fishery Management Review Board (appointed by the President) is proposed to hear appeals on regulations promulgated by the Secretary.

Both bills have provisions for overcoming differences of opinion between Councils and the

Secretary and for unreasonable delays in implementing regulations. For example, in the Senate bill, the Secretary may prepare management regulations for council review and implementation when councils fail to propose regulations in a reasonable period of time. In the House bill the Secretary is authorized to prepare a fishery management plan when a plan is needed and a Council fails to do so. Further, there is a provision for the Secretary to implement regulations on certain species which move into State waters, pursuant to an approved plan prepared under the legislation, in order to ensure fisheries management effectiveness.

In conclusion, it should be quite clear by now that sound, comprehensive planning is viewed as a very important component of the management process, and has received considerable emphasis in the ongoing State-Federal Fisheries Management Program. The Congress too, in its preparation of HR 200 and S. 961, has recognized the need for planning as an integral part of the fisheries management process; management plans are required provisions of both bills. In spite of this emphasis on planning, however, we must not lose sight of the fact that management plans are only means of reaching certain ends, and not the ends themselves. A plan is nothing more than a map, a guide, a method of proceeding. In the final analysis, it is the implementation of those plans which is necessary to accomplish our fisheries management goals and objectives.



# **THE OCS FORGOTTEN LAND: TERRITORIAL SEA, NEARSHORE, AND ESTUARY**

**By JAMES I. JONES**

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There exists, bordering each coastal State, a region of major environmental and economic importance to that State. This region is variously called the non-Federal OCS or the State territorial sea, and includes the State's nearshore and estuarine region. In the South Atlantic region of the United States, this area extends from the coastal region offshore to three nautical miles. It consists of the most naturally productive and environmentally sensitive areas of the OCS, and includes the coastal marine marshes and estuaries as well as the shallow-water offshore areas bordering the coast. These areas are well known as the primary nursery grounds and breeding habitat for many coastal marine species. The region also includes the beaches and other shoreline features characteristically utilized for recreation by tourists and local residents. Because of these important and unique characteristics, the Southeastern States are gravely concerned about the environmental and other impacts which may impinge upon these areas as a result of OCS petroleum development activities. The unique geographic position occupied by the non-Federal OCS, occurring as it does between the OCS developmental activity and the shoreline, dictates a high level of interest and concern by the States. Its natural productivity, coupled with its environmental vulnerability and fragility are additional reasons for concern. Finally, its utilization as a recreational and fisheries resource, as well as a major area for waste disposal, provide legitimate reasons for a high level of State concern regarding this region.

A number of activities are characteristically scheduled in the petroleum resource development of an OCS region. Typically, an environmental evaluation program is initiated following an announcement of future leasing, but prior to that leasing. The preliminary environmental assessment consists of the collection of "benchmark", or "baseline", data, which precedes any developmental activity. Following the lease sale, and concurrent with developmental activities, a program of environmental monitoring is developed. These

programs, consisting of "baseline" measurement, followed by monitoring, are developed to evaluate conditions on the Federal OCS area. Only limited efforts have been made concerning the non-Federal OCS region. These efforts, when they exist, are called "special studies" to separate them from the routine, on-going programs to evaluate the Federal OCS region. While some of the reasons for emphasizing the Federal OCS are obvious, the rationale which allows the preclusion of major efforts on the non-Federal OCS area, based on the premise that only the Federal portion need be studied by Federal agencies, is patently incorrect. Furthermore, it is highly injurious and unfair to the States bordering Federal OCS developmental activities. The single greatest potential for environmental and other damage exists in the non-Federal OCS area. It is within this area that maximum natural productivity exists, and where the ecosystem is considerably more vulnerable and fragile than that further offshore. While the Federal Government may not have a strict legal obligation to conduct extensive environmental studies on the non-Federal OCS area, and this is open to question, it certainly has a moral obligation to do so. The source of potential damage to this region exists because of developmental activities on Federal lands, which have been initiated by the Federal Governments' leasing of that land, exclusively for Federal financial benefit. It is inconceivable, but unfortunately true, that the Federal Government chooses to ignore its obligation to evaluate and protect the non-Federal area merely because it does not hold title to those lands. The danger to them is clearly and solely the result of Federal action. The mere fact of State ownership does not obviate the obligation of the Federal Government to evaluate and monitor the environmental health of these areas at least as well as is being done on the Federal portion of the OCS. Indeed, a somewhat greater level of effort is appropriate, due to the greater productivity, fragility and potential for negative impact which prevails on the non-Federal OCS area.

A myriad of Federally sponsored programs which have been developed by various agencies address different aspects of the OCS and coastal region. Agencies having a major commitment to these programs include the U. S. Geological Survey, the Fish and Wildlife Service, and the Bureau of Land Management from the Department of the Interior, while the National Oceanic and Atmospheric Administration, through its Office of Coastal Zone Management, has had the major role for coastal program development in the Department of Commerce. The Environmental Protection Agency and the Energy Research and Development Administration have also initiated programs relative to nearshore environmental concerns. While there are many existing and proposed programs dealing with specific areas of States' coastal concerns, it need be emphasized that neither the Department of the Interior, through its Bureau of Land Management environmental program, nor the Department of Commerce through its Office of Coastal Zone Management have addressed the specific problem of environmental evaluation and monitoring in the non-Federal OCS. The Bureau of Land Management does not as yet recognize a responsibility to develop comprehensive programs on non-Federal OCS lands, while the Office of Coastal Zone Management, even though recognizing its responsibility in this area, does not place a sufficiently high priority on such studies to allow their initiation and development. This failure on the part of the Federal Government is one which must be recognized and rectified, through whatever actions the coastal States find necessary. The simple logic of "Federal responsibility for Federal actions" is unassailable. The bureaucratic expedient of refusing to recognize or accept responsibility for Federal actions which impact upon the States is one which must not be allowed.

The coastal States are limited both fiscally and geographically in the extent of their ability to respond to OCS developmental activities. The fiscal limitation is obvious—individual States do not have sufficient financial resources to conduct large-scale environmental evaluation programs over large areas of their OCS. The geographic limitation is one which derives from the inability artificially limit study of the extent and effect of natural processes occurring within the non-Federal OCS. These natural processes do not recognize artificial boundaries which may be imposed by man. Since the analysis and evaluation of these processes requires a range of studies which frequently include the territorial sea, or near-shore and estuarine areas

of adjacent States as well as the Federal OCS area, it is difficult or impossible for a single State to successfully conduct such studies, even if fiscal limitation were not a factor. Recognizing these limitations, it behooves the coastal States to seek and find Federal support for non-Federal OCS environmental studies. Additionally, it is appropriate for the States to cooperate, to collectively develop those programs which analyze and evaluate natural phenomena throughout the extent of their range, without regard to artificial boundaries imposed by man. State consortia, such as that represented by the Coastal Plains Regional Commission, appear to represent a viable existing institutional mechanism through which the member States may mutually address these problems. Individual State action, in addition to the cooperative interstate endeavors, is also required. The evaluation of nearshore impacts upon a single State must be achieved primarily by that State, whatever the source of study funds. Comprehensive evaluations of socio-economic, as well as environmental impacts must be developed on a State-by-State basis. One example of such a comprehensive evaluation with which I am personally familiar is the Florida Comprehensive Continental Shelf and Shore Program. This program provides the basic information for environmental, social and economic impact evaluation which, with minor revision, could serve any coastal State as a program model. The coastal States, with a few exceptions, have been relatively inactive in their efforts to develop such studies. Those which have been developed generally address very specific areas, such as estuaries, and are limited to one or a few aspects of these areas. No comprehensive evaluation, such as that described in the Florida Comprehensive Continental Shelf and Shore Program, has yet been initiated by any coastal State. Federal activities, as previously discussed, do not include comprehensive near-shore or on-shore impact evaluation.

The program needs, then, are obvious. Studies must be comprehensive, including impact evaluation for environmental, social, and economic factors. They must be geographically "sound", including both Federal and non-Federal OCS areas, and must not be limited by State boundaries. They must fulfill broad requirements for long-term decision making by both Federal and State policy makers. Finally, the potential impacts must be identified and evaluated, with alternate future analysis for each level of impacts.

In closing, I would like to tender the following

conclusions and recommendations for your consideration.

It is concluded that:

1. An extensive geographic area of major concern to the coastal States exists adjacent to, and inshore of, the Federal OCS. This area, referred to here as the "non-Federal OCS," consists of the territorial sea, nearshore, and estuarine regions of each State.
2. The non-Federal OCS, even though it is the region most likely to be impacted environmentally by development activities on the Federal OCS, has not been, and is not being, sufficiently studied and evaluated in regard to potential environmental and other impacts.
3. Since Federal agencies either disclaim an obligation to initiate and conduct environmental and other impact evaluation studies in this area, or give such a low priority to these studies that none have been, or probably will be, initiated within the essential time period for study, it behooves the States to take action individually and collectively to correct this omission.

The following recommendations are made:

1. The States included within the South Atlantic OCS lease sale area (North Carolina, South Carolina, Georgia, and Florida) should, individually and collectively, develop environmental and socio-economic evaluation programs for their territorial sea, nearshore, and estuarine areas. An example of such a program is the Florida Comprehensive Continental Shelf and Shore Program.
2. Federal agencies, consisting of the Bureau of

Land Management, the Environmental Protection Agency, the Energy Research and Development Agency, and particularly the Office of Coastal Zone Management, should be made abundantly aware of the States' concern in regard to Federal indifference, for whatever reason, to the plight of the States in their efforts to initiate environmental and other evaluation studies, with Federal assistance, in the non-Federal OCS region.

3. The Coastal Plains Regional Commission should, as an existing and logical state consortium, act as the catalyst to develop State/Federal cooperative impact evaluation programs in the South Atlantic OCS lease sale area.

It should be emphasized that, in the National interest and for State needs and benefits, those States involved in the South Atlantic OCS leasing desire timely, orderly and well-considered development of the petroleum resource offshore their respective boundaries, there being no desire to hinder or delay such development. There is, however, the recognition that under present temporal and fiscal constraints the problem of impact evaluation of the non-Federal OCS is not being adequately addressed, and that this omission must be corrected through cooperative state and Federal action.

No less than the quality of life for generations of future citizens of the States of North and South Carolina, Georgia, and Florida is at stake. If we judge wisely and prudently, with the best possible information upon which to base our decisions, those generations may thank us for our foresight and wisdom. If we fail them, they shall, with every justification, damn us for the needless destruction of their environmental heritage.

# THE ROLE OF ENGINEERING IN MINIMIZING OFFSHORE IMPACTS

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## INTRODUCTION

One of the major types of impacts resulting from the development of the Outer Continental Shelf (OCS) is that concerned with the planning, design, construction, operation and maintenance of shore reception facilities. Any type of development undertaken on the OCS is going to involve or require some type of support facility. There is simply no way to avoid meeting these requirements, and it should be clearly understood that some type of facility will be required. This may involve nothing more extensive than a helicopter landing pad or a small boat landing. On the other hand, it may require a very extensive and expensive engineering system consisting perhaps of landfills, channelization projects, storage tanks, piers, wharfs, artificial islands, pipelines, breakwaters and bulkheads.

The purpose of this presentation is to draw your attention, by the use of several examples, to the question of how this impact can be minimized through creative engineering. In addition, I want to leave with you the thought that before any project is undertaken that all of the alternatives be carefully considered and that the long term economic picture be sharply brought into focus. This requires that one be very wary, and even skeptical, of both traditional and "far out" engineering solutions because there is an advanced technology, developed within recent years at great expense, which is available and appropriate for ocean and nearshore applications.

Several examples of both poor and beneficial developments, illustrating some aspects of this advanced technology will be shown. These examples will indicate: (a) how a land reclamation project can be undertaken which is compatible with the existing natural structures — in this case a coral reef; (b) how recent developments in mooring and offloading systems can be utilized to minimize ship meetings, and therefore the risk of collision and resulting pollution; (c) how certain developments in new ship constructions and ship operations will minimize further the risk of pollution from dirty ballast water.

## LAND RECLAMATION

Since before the Middle Ages, the Dutch have carried out land reclamation projects on a grand scale, but the central objective of most of these projects was to increase the amount of arable land. Only within recent times has there been a need to carry out land reclamation projects in conjunction with the needs for marine facilities. A refinery typical of those designed and constructed in the years immediately following World War II is a 40,000 bbl/day refinery located on the western shore of Buckner Bay, Okinawa. The refinery includes crude oil storage tanks, the product storage tanks, and the process block. The terminal facility is a conventional pier which is used mainly for servicing crude oil carriers. At the time it was built, most of this refinery's output served the local market, so that there was little need to service product tankers at this pier.

There was no provision for expansion of the refinery. Any expansion of the refinery landward would require that these lands be taken out of production. Since water depths are limited by the natural conditions at the pier, the deeper draft tankers cannot be handled without undertaking a costly dredging and channelization project. Thus, this type of development is one that in terms of the unit quantity of finished product impacts very heavily on the environment.

A somewhat different approach, also at Buckner Bay, was one where additional land for expansion was provided via a land reclamation project, the fill material for which was provided by a channelization project. A breakwater serves as the retention dike for the fill material which was obtained from selected borrow areas offshore. Several advantages of this particular land reclamation project can be enumerated. First, the amount of land diverted from agricultural and residential use has been minimized. Second, the space enclosed by the breakwater and the former shoreline has been converted from its former use, which was that of providing marginal subsistence to local fishermen, to a higher use. Third, the reef structure was maintained intact throughout construction and serves to reduce the

risk of subsidence of the breakwater. Fourth, the fill material that was used in the land reclamation project was obtained from areas that would have had to be dredged in order to accommodate the supertankers and VLCC's. Fifth, by reducing the distance between the refinery and the marine facilities, the pipeline and associated investment and operational costs are reduced correspondingly.

In summary, this is an example of how a land reclamation project has been undertaken with a minimum impact on the environment.

### MOORING AND LOADING SYSTEMS

There are essentially three types of mooring and loading systems which are described as sea islands, multi-point, and single-point mooring systems. Sea islands are very similar to conventional piers and represent a simple extension of existing pier technology. The main difference between sea islands and conventional piers is that sea islands are connected to the mainland by means of a submarine pipeline whereas conventional piers have pipe-trestle connection.

A multi-point mooring system consists of a number of enclosed bouys arranged in a partial-circular pattern around the desired position of the vessel, such that when the ship's anchors are dropped, the circular pattern is completed. The loading system consists of a submarine pipeline from shore that connects to a submerged hose that in turn is connected to the ship's manifold. Multi-point mooring systems have been used to handle vessels of up to 100,000 dead weight tons displacement and are generally designed for moderate environmental conditions where the prevailing winds, currents and/or waves have strong directionality.

A single-point mooring system differs from the multi-point mooring in that the vessel is free to weathervane around a fixed point. Single-point mooring systems are more suitable for severe environmental conditions than are multi-point systems. Single-point mooring systems have been designed to handle the largest size tankers placed in service to date.

The fact to be emphasized is that the use of the mooring systems such as described above permits the use of larger tankers than would otherwise be possible. Contrary to a popularly held notion, the use of larger ships does not, of and by itself, present a greater pollution risk. Use of larger tankers reduces the risk of collision and the risk of grounding and while the larger tankers individually

present a greater pollution threat, it is more important to reduce the overall risk by reducing the number of incidents than to reduce the size of each incident.

Also, it is well to understand that use of these systems eliminates the risk of collision during the approach and maneuvering alongside conventional harbor piers. In most cases, operations with these systems takes place in open waters with virtually no nearby hazards.

In summary, use of mooring and loading systems results in a minimum offshore impact; much less than would otherwise occur if a greater number of smaller vessels operating in close quarters were employed.

### SHIP CONSTRUCTIONS

There are some developments taking place in the area of ship constructions that will be of interest to anyone who has ever had the annoying experience of having their feet, or footwear, soiled by certain hydrocarbons while walking along the beaches of the Southeast United States. To give you a little background information, most, if not all, of the occurrences of tar patches and tarballs along the coast lines are the result of the discharge of dirty water ballast from ships' tankage while in transit. To illustrate the problem, any tanker after discharging its cargo, must for safety reasons, take on ballast in its cargo tanks. The mixture of ballast water with cargo residues results in dirty water ballast.

For many years the member Nations of the Intergovernmental Maritime Consultative Organization (IMCO), an agency of the United Nations, have been concerned about existing conventions on marine pollution including oil, as well as other noxious substances, sewage, and garbage. Before the 1973 International Conference on Marine Pollution, only the discharge of oil was regulated. The convention regulations as adopted by the signatory Nations of IMCO of the 1973 Conference are quite lengthy; thus only the more pertinent provisions affecting new ship constructions and discharge of dirty water ballast are presented herein. Essentially the regulations provide for the following three basic control measures:

1. New construction orders placed after December 31, 1975 are required to have segregated ballast capabilities. (The segregated ballast concept appears to be the primary long-term measure for pollution avoidance from all crude tankers.)

2. Optional and/or mandatory provisions for retention of oil on board. (This refers to the load-on-top procedure and is regarded as an interim, if not long-term, solution to immediate abatement of oil pollution.)
3. Construction of shore reception facilities. (Mandatory in certain designated special areas.)

These regulations, along with many others, will have the effect of virtually eliminating the incidents of discharge of dirty water ballast. Other regulations of the same Convention will minimize the risk of ship collisions and groundings through mandatory traffic control rules and accident prevention measures.

These developments in ship constructions and operational procedures well illustrate again how

offshore impacts can be minimized.

### SUMMARY

The foregoing three examples of land reclamation, mooring and loading systems, and ship constructions and operations each contain elements of technology that has been developed within relatively recent times. It is important to realize that this technology, as illustrated by these examples, has been utilized to accomplish some worthwhile project or objective in such a way that the environmental impact is negligible, or at the very least minimized. The point to be made here is that technology, far from being the scapegoat, or root cause, of our environmental problems, is actually the door leading to a satisfactory resolution of most of the conflicts in connection with various development proposals of the Outer Continental Shelf.

# OFFSHORE PETROLEUM DRILLING AND PRODUCTION

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The Arab oil embargo of 1973 clearly demonstrated our vulnerability in relying on energy sources outside the United States. One of the alternatives available toward reducing our energy supply gap is the petroleum potential of the U.S. continental shelf. To date, less than three percent of this area has been leased, yet in 1974 that small fraction provided nearly 17 percent of the gas and 20 percent of the oil available from domestic sources.

One of the key questions in deciding whether to expand this activity is, "Can these resources be produced without detrimental effect to our environment?" Worldwide industry offshore operating experience, especially in the U.S. where more than 19,000 wells have been drilled over a quarter of a century time span, provides an affirmative answer. I will review a brief history of offshore operations, their scope and diversity, examine those areas on the Atlantic Outer Continental Shelf (OCS) where the greatest potential hydrocarbon resources are thought to exist and, finally, I will attempt to give you a feel for the sequence of events that will result once a lease is acquired.

This history of offshore development goes back to 1896 with the tiptoe entry of the industry into ocean waters beginning in California's Santa Barbara Channel with the drilling of the seaward extension of the Summerland field from wooden piers built outward from the shore. Another milestone was reached in 1926 when production was established in Lake Maricaibo, Venezuela, where onshore fields suggested the presence of additional oil and gas deposits in offshore waters. In 1937, oil was discovered in shallow waters off Louisiana about a mile from shore in wells drilled from a wooden platform structure. The modern offshore area began in 1947 when the first well was completed from a steel platform out of sight of land in the Gulf of Mexico. This act released the industry from the limitations of posted barges and shallow platforms.

Today, exploration and production activity offshore is a worldwide enterprise primarily utilizing U.S. technology. Some 50 countries either now have, or are about to have, offshore production,

and some 65 others have exploration activities being conducted on their continental margins. These operations are being successfully carried on in the hurricane prone Gulf of Mexico, in the ice laden tides of the Cook Inlet, and in the stormy North Sea where waves can exceed 100 feet and wind velocities over 100 knots. Drilling has been carried out in water depths up to 2,300 feet. Wells have penetrated nearly 23,000 feet into the earth's crust. Fields are being developed as far offshore as 170 miles. Platforms have been erected in 475 feet of water and structures for more than 1,000 feet of water are being constructed.

The scope and diversity of these activities reflect that the industry would not undertake these ventures into the oceans if the need for petroleum energy resources were not real. From a marine environment standpoint, these operations must be deemed either as basically sound, or as a worldwide threat. If the activity is sound, it should proceed on a broad front to orderly develop hydrocarbon resources for human benefit. If it is defective, it should be terminated everywhere. I know of no findings to support the latter course.

The areas where these operations are now being conducted off the U.S. Coast are: The Gulf of Mexico, the Pacific off Southern California, and the Cook Inlet of Alaska.

Through 1974, the cumulative total quantities of hydrocarbon liquids and natural gas produced from these areas amounted to more than 6 billion barrels and 32 trillion cubic feet respectively. Offshore Louisiana is the dominant producing area both in liquid hydrocarbons (4.5 billion barrels) and natural gas (29 trillion cubic feet). California has produced significant quantities of hydrocarbon liquids (1.6 billion barrels) while offshore Texas production, amounting to 29 million barrels of liquid hydrocarbons and 2 trillion cubic feet of natural gas, has been relatively small.

With those numbers fresh in your mind, I think the recent estimates by the U.S. Geological Survey (USGS) of future offshore potential will be of interest. For the total U.S. OCS these estimates range from 10 to 48 billion barrels of oil and from 33

to 191 trillion cubic feet of natural gas. Alaska and the Gulf of Mexico are believed to have the greatest potential. Potential reserves under the Atlantic OCS are thought to be significant with estimates ranging from 2 to 4 billion barrels of oil and 5 to 14 trillion cubic feet of gas.

Along the Atlantic Coast, the most likely areas for significant hydrocarbon accumulations are believed to be in the Georges Bank Trough, the Baltimore Canyon Trough, and the Southeast Georgia Embayment-Blake Basin areas. The current Bureau of Land Management (BLM) planning schedule calls for one sale in each of these areas during 1976 with the South Atlantic sale scheduled for November 1976.

Assuming that these sales will indeed be held as forecasted, let's look at what can be expected to transpire following a lease sale. My comments will center on three key elements of offshore petroleum activity: exploratory drilling, field development, and production operations, and another very important matter, safety and regulations.

The exploratory phase of offshore operations encompasses drilling from mobile vessels in the effort to discover and define the extent of oil and gas fields. The type of vessel used depends on such factors as water depth and sea conditions. Most common are drilling ships, semi-submersibles, and jack-up rigs. All three types have features unique to petroleum operations, and all have proven their integrity under severe weather and sea conditions. From an environmental standpoint, these vessels provide operating personnel the means for drilling, evaluating, and abandoning exploratory wells with little more than a temporary visual impact while on location.

The unique feature of the jack-up rig is the system of long legs attached to a specialized hull which supports the drilling equipment. The rig is floated onto the location, the legs jacked down to the sea floor to anchor the rig, and the hull itself is lifted up out of the water. This type of rig can be used to about 350 feet of water depth.

A typical semi-submersible rig can be used in water depths up to about 1,500 feet, with rigs under construction for water depths up to 3,000 feet. This rig floats on the surface while being moved from one location to another. Once on location, the pontoons which provide vessel buoyancy are ballasted and submerged such that the rig floats about half-out of the water. The rig is then held on location with a series of anchors and cables extending from each of the four corners. The major advantages of this type of rig are that it can drill in deeper waters than the

jack-up and is very stable in heavy seas.

The third type rig is the drill ship which is also generally held on location with a series of anchors extending from the bow and the stern, but in some cases, may be free floating and maintained on location by a sophisticated electronically-controlled propulsion system. These ships are not as stable as the previous types of rigs discussed, but are capable of drilling in 1,000 foot water depths. An advantage of this rig is the large capacity for storage of supplies, which minimizes the logistics problem when drilling far from land in deep waters. This type rig is now being designed to drill in 3,000 feet of water, and at least one ship capable of drilling in 6,000 feet of water should be available by mid-1976.

If exploratory drilling efforts are successful and an oil and gas field is found and proven commercial, we move into the development phase, consisting of four parts: platforms, additional drilling, production facilities, and pipelines.

The key element in this operation is the platform, serving as a base for development drilling and for production facilities. Platforms are usually built onshore, transported to location, set, and secured in place by piles driven or drilled into the ocean floor.

Structural integrity is, of course, of paramount importance in the design of the platforms. Wind, waves, current, and earthquake forces are considered in combinations reasonably likely to occur at the location of installation. These designs are based on research, testing, and industry operating experience over many years.

When platform installation is completed, one or two conventional rigs are placed on the platform and development drilling operations begin. Wells are directionally drilled to produce the oil from a large area of the reservoir. It is not unusual for the terminal point of these wells, measured horizontally, to be more than a mile from the platform. This capability to drill wells directionally with precision is an important factor in minimizing the number of platforms required for field development, thereby also minimizing both environmental impact and investment. When an offshore lease is fully developed, the surface area covered by platforms is typically in the order of one hundredth of one percent.

After drilling is completed, a subsurface safety valve is required by regulations to be installed at least 100 feet below the sea floor, and remotely controlled from the platform. These valves are designed to automatically shut off flow in the event of fire or surface equipment failure. They must be



tested for proper operation when installed and thereafter at regular intervals during the life of the well. In addition to these downhole valves, each well is required to have, at the platform, both a manually operated master valve and an automatic "fail-close" valve.

Production operations typically include facilities to handle crude oil, natural gas, and produced water. Extensive control devices guard against leakage or fire in case of equipment failure. These devices include automatic shut-in controls, high and low pressure and liquid level shut-in sensors, and fusible plugs at strategic points. These, too, are tested frequently to insure proper operation. Drip pans under equipment and curbing around each platform contain any minor oil spillage. A collecting tank or sump recovers this small amount of oil which might otherwise enter the sea.

Another important feature of the platform designs are the remote emergency shut-down stations. These are located at platform exits, at the heliport, and at boat landings. At these points, one man can shut down the entire platform and close in all wells in a matter of seconds.

The missing link at this point is product transportation. Pipelines are the preferred method of moving the product. These lines are generally laid by specially designed barges. Sections of pipe are welded together on the barge, strung out behind the barge, lowered to the sea floor, and then buried about 3 feet deep where required.

Having briefly run through the sequence of events that takes place to develop an oil and gas field, let me turn to a very important topic which I have chosen to call Safety and Regulations. Each operator has his own stringent safety plans and procedures for every phase of the operation. These plans and procedures are complemented by trained and responsible people on the job. In addition to the individual company procedures, we are regulated by several Federal agencies. The major ones are the U.S. Coast Guard, the Corps of Engineers, the Environmental Protection Agency, the Department of Transportation, BLM, and the USGS. Let me focus on the USGS as it is the predominant regulating agency for day-to-day operations.

There are now 13 USGS Orders for Oil and Gas Operations on the OCS. The USGS is charged with designating standards of performance, regulating the performance, monitoring the activity, and enforcing the regulations. To the general public, the first and twelfth Orders may be the most important because they provide for conspicuously identifying wells and platforms so that it is impossible for an imprudent operator to hide, and also provide for

public inspection of records so that an imprudent operation cannot be lost in a file cabinet. To those of us in industry, the other eleven orders are equally important because they deal with the details of the drilling operation, plugging and abandonment of wells, determination of well producibility, requirements for safety devices in the wells themselves, procedures for completing wells, requirements for pollution prevention and waste disposal, procedures for designing platforms and equipment, procedures for designing and installing pipelines, procedures for sulfur drilling, stipulation of the rates that oil and gas wells may be produced, and accuracy of production measurement.

To enforce these regulations, the USGS maintains five district offices in the Gulf of Mexico area; they employ 41 technicians or inspectors, and they have at their disposal 12 helicopters. During 1974, these inspectors conducted 2,500 platform and 1,300 rig inspections. More than half of these inspections were unannounced. I might mention at this point that a typical platform has more than 200 safety devices, and some complex platforms may have 400 safety devices.

Although environmental protection measures are stringent and rigidly enforced, the possibility of an accident still exists. Industry cooperatives have been formed to cope with oil spills. Groups such as Clean Gulf Associates comprised of 40 operators in the Gulf of Mexico, representing 99 percent of production in the area, have acquired an arsenal of oil spill clean-up equipment including oil containment booms, skimmers, and barges with capability for operating in open seas. The need for such equipment in the future is certainly limited, but its development, availability, and continuing improvement clearly reflects industry's commitment to protecting the offshore environment.

To better understand the environmental impact of operations in ocean waters, the industry has funded studies such as the recently completed 2-year Offshore Ecology Investigation. Undertaken by the prestigious Gulf Universities Research Consortium, with 23 principal scientists from 11 universities and two non-profit research institutes participating, the study showed that there was no harm done in the 400 square mile study area off Louisiana, despite the fact that extensive operations there have been ongoing for more than 25 years. Seasonal changes resulted in a significantly greater variability in all of the data than could be ascribed to the presence or absence of petroleum operations.

The onshore impact of these operations is relatively small. For example, at Grand Isle, Louisiana, which serves as a major operations base

for both offshore operators and numerous industry related service companies, less than 200 acres of land are required. In addition, some 200,000 barrels per day of crude oil moves by pipeline across the beach. Because the lines are buried and not discernible, visitors enjoying this widely used recreational area are seldom aware of this compatible use.

Offshore petroleum operations are providing important energy supplies to the United States. Our industry has been operating offshore for 27 years. We have drilled more than 19,000 wells and we have produced more than 6.5 billion barrels of oil and 32.6 trillion cubic feet of gas. In all phases of this activity, including exploration, field development

and production, environmental protection is a key consideration. Protective measures include personnel training, elaborate safety equipment, automatic controls, and back-up equipment. An overall good record of past performance offshore will be enhanced in the future by continuing technological improvement, by effective regulation, and by the industry's determination to protect the environment wherever it operates.

I can assure you that if we are fortunate enough to develop commercial production off of your coast, the platforms will become one of the best fishing spots in the area, just as they now are in the Gulf of Mexico.

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